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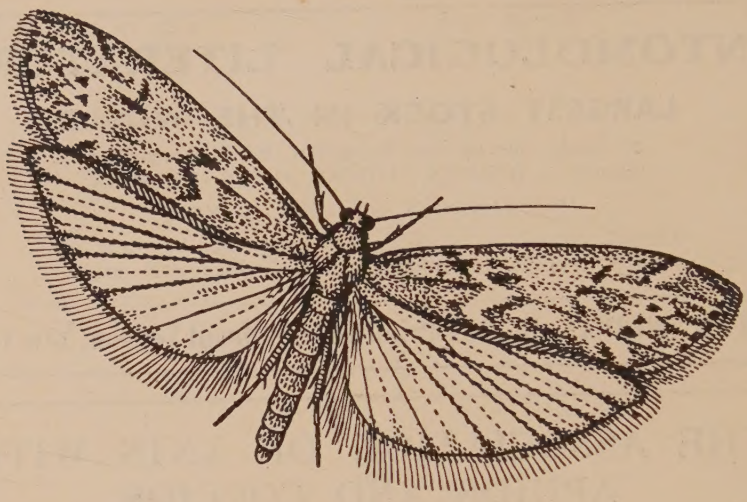

THE MEDITERRANEAN FLOUR MOTH

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Hueck (H. J.). **Influence of Light upon the Hatching of Winter-eggs of the Fruit Tree Red Spider.**—*Nature* **167** no. 4259 pp. 993–994, 1 graph, 3 refs. London, 1951.

Becker (H.). **Über den Einfluss konstanter Temperaturen, relativer Luftfeuchtigkeiten und Licht auf die Frühjahrsentwicklung der Wintereier der Obstbaumspinnmilbe** *Paratetranychus pilosus* **Can. et Fanz.** [On the Influence of constant Temperatures, relative Humidities and Light on the Spring Development of Winter Eggs of *P. pilosus*.]—*Anz. Schädlingsk.* **25** pt. 8 pp. 116–118, 5 figs., 10 refs. Berlin, 1952.

In the experiments described in the first of these papers, which were carried out in Holland in March 1950, overwintered eggs of *Paratetranychus pilosus* (C. & F.) (*Metatetranychus ulmi*, auct.) on twigs were placed in petri dishes and kept at 80 per cent. relative humidity and 25°C. [77°F.] in darkness or in daylight. The mean percentages that hatched were 40 and 60, respectively, in a preliminary test, and 52 and 75 in a more detailed one. Eggs that failed to hatch in the dark were found to contain fully developed embryos. The newly-hatched mites were shown to be strongly attracted to light, and it is assumed that although darkness does not hinder embryonic development, it is light that provides the main stimulus to hatching. When the eggs were placed in boxes covered with various colour filters, the percentage that hatched decreased as the wave-lengths became greater, ranging from 95 for blue light to 57 and 62 for orange and red.

In a repetition of these experiments, described in the second paper, eggs taken from grape vines in south-western Germany in March 1952 were kept for several days at 5°C. [41°F.] and then incubated at 24°C. [75·2°F.], either in darkness or under artificial light for 12 hours per day. It was confirmed that mortality was higher in darkness, but no evidence was obtained of any relation between wavelength and mortality, except that many embryos died at an early stage of development under ultra-violet light. It is considered highly unlikely that light has any physiological effect on embryonic development.

In other tests, eggs were transferred from the refrigerator to incubation chambers at various constant temperatures and humidities. At 100 per cent. relative humidity, the mean period required for hatching decreased as temperature rose and was least (about ten days) at 24°C.; only one egg hatched at 28°C. [82·4°F.] and none at higher temperatures. Earlier work by J. Listo in Finland had indicated 12–17°C. [53·6–62·6°F.] as the optimum for hatching. At 24°C., the period decreased as relative humidity rose to 90 per cent. and then increased slightly, and mortality varied similarly.

Haine (E.). **Weitere Bekämpfungsversuche mit** *Euproctis chrysorrhoea* **L. und** *Diprion sertifer* **Geoffr.** [Further Control Experiments with *E. similis* and *D. sertifer*.]—*Anz. Schädlingsk.* **25** pt. 9 pp. 129–132, 2 refs. Berlin, 1952.

In view of an outbreak of the gold-tail moth, *Euproctis similis* (Fuessly) (*chrysorrhoea*, auct.) [*cf. R.A.E.*, A **36** 26], on the Friesian islands of Borkum and Juist, experiments were made in 1951 on the effect of treating the nests in spring with 4 per cent. dilutions of various proprietary preparations of DNC with oil or tar distillate. Mortality was low whether the nests were dipped before the larvae issued from them or sprayed while the larvae were on their surface. In tests of proprietary contact insecticides against the older larvae, the best results were obtained with a chlordane emulsion spray, which gave complete kill and was much superior to the

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others tested, though several of these, including sprays of BHC alone or with DDT, a parathion emulsion spray and a methyl-parathion dust, also gave complete mortality of larvae of *Neodiprion* (*Diprion*) *sertifer* (Geoffr.).

SCHMUTTERER (H.). *Plastophora rufa* **(Wood) (Dipt., Phoridae) als Eiräuber und Parasit von** *Eulecanium corni* **(Bché) (Homopt., Coccoïdea).** [*P. rufa* as an Egg-predator and Parasite of *E. corni*.]—*Anz. Schädlingsk.* **25** pt. 10 pp. 145–148, 12 figs., 12 refs. Berlin, 1952.

During investigations in Bavaria in 1949 on the bionomics of *Eulecanium corni* (Bch.), which infests fruit and shade trees, larvae of a Phorid were found in late May and early June preying on the eggs of that Coccid on *Prunus spinosa*. They pupated in the laboratory, but no adults emerged. None was seen in 1950, but three identical puparia were reared in May 1951 from a female of *E. coryli* (L.) collected in Munich, and about 20 larvae were discovered in July among egg-batches of *E. corni* on elm in the Bavarian Alps. They pupated in the first half of August, and the adults, which emerged in April and May 1952, were identified as *Plastophora rufa* (Wood). The third-instar larva, the puparium and adult emergence are described.

Observations showed that *P. rufa* has one generation a year. The females oviposited among the eggs beneath the females of *E. corni*, and the larvae first consumed the eggs and then fed on the parent scales, whether these were living or dead. They became full-fed in about 10–14 days and then left their hosts, generally in wet weather, and pupated in the soil. The pupae overwintered. Occasionally, 2–3 larvae were observed beneath a single scale, and both larvae and pupae required high humidity to complete their development. The percentage of egg-batches attacked was low, reaching 10 in one instance recorded.

BEYER (F.). **Bekämpfung der Narzissenfliege mit Berührungsgift auf Gamma-Basis.** [Control of *Merodon equestris* and *Eumerus strigatus* with contact Poison based on γ BHC.]—*Anz. Schädlingsk.* **25** pt. 10 pp. 149–151. Berlin, 1952.

The hot-water, fumigation and pressure-chamber treatments developed in Holland for the control of *Merodon equestris* (F.) and *Eumerus strigatus* (Fall.) in *Narcissus* bulbs do not prevent infestation and are little used in the neighbouring region of Germany, where cultivation is less intense. In preliminary tests in 1950–51, dusting a bulb infested by *M. equestris* with BHC powder before planting did not prevent the larva from completing its development and giving rise to an adult, but mixing BHC as a dust or a suspension with the soil proved effective, death ensuing after the larva had left the bulb to pupate. An attempt to prevent infestation in the field by soil treatment with a BHC dust applied in March gave inconclusive results, for although infestation was apparently reduced, it was very low in the controls.

ENGEL (H.). **Die Bekämpfung des Getreideplattkäfers** *Oryzaephilus surinamensis* **L. in Wohnräumen.** [The Control of *O. surinamensis* in Living-rooms.]—*Anz. Schädlingsk.* **25** pt. 10 p. 152, 2 refs. Berlin, 1952.

Large numbers of adults of *Oryzaephilus surinamensis* (L.) were reported in June 1951 in crevices in the walls and in the rooms and furniture of two

adjacent houses in a village in western Germany, the focus of infestation being a disused stable. Various insecticides, including a DDT dust and a BHC spray at double the recommended concentration, were applied with little or no effect, but when the houses were sprayed throughout with 0·05 per cent. E 605 F [an emulsion concentrate containing 70 per cent. parathion], kept closed for 24 hours, and then ventilated for about ten hours, the infestation was completely eradicated and did not recur.

Völk (J.), Bode (O.) & Hauschild (I.). **Untersuchungen zur Frage eines Zusammenhanges zwischen Düngung, Blattlausbesatz und Krankheitsausbreitung in Kartoffelbeständen. I. Mitteilung.** [Investigations on the Question of a Correlation between Fertiliser, Aphid Infestation and Spread of Disease in Potato Fields. First Communication.]—*Z. PflKrankh.* **59** pt. 3–4 pp. 97–110, 6 figs., 10 refs. Ludwigsburg, 1952. (With a Summary in English.)

Earlier findings that the use of potassium chloride as a fertiliser increases the incidence of leaf-roll on potato were confirmed in field experiments in Germany in the summer of 1949, but in extensive investigations described in detail, no consistent differences were found between the numbers (per 100 leaves) of the commonest potential vectors, *Myzus persicae* (Sulz.) and *Aphis* (*Doralis*) *rhamni* Boy., on plants given no fertiliser and on those given potassium chloride, a nitrogenous fertiliser or both, with or without the addition of phosphorus as basic slag, except that *M. persicae* was least numerous on plants that received potassium chloride alone. This result tends to contradict the view that the migrants prefer the leaves of such plants, and no preference for them could be shown in laboratory experiments.

Thalenhorst (W.). **Zur Kenntnis der Fichten-Blattwespen. I. Die Nematinen des Südharzes.** [Contributions to Knowledge of the Spruce Sawflies. I. The Nematini of the southern Harz.]—*Z. PflKrankh.* **59** pt. 3–4 pp. 110–115, 3 figs., 5 refs. Ludwigsburg, 1952. (With a Summary in English.)

The causes of mass outbreaks of insect pests can be studied with advantage by investigating fluctuations in normal populations. It is possible to do this in the intervals between outbreaks [*cf. R.A.E.*, A **42** 57], in districts outside the geographical limits of outbreak areas, or by studying a closely related insect that is not subject to outbreaks. Observations were accordingly begun in 1950 on the abundance of Nematine sawflies on spruce in the southern Harz region of Germany, where they are not of economic importance, as a supplement to investigations on a recent outbreak of *Pristiphora abietina* (Christ) on that tree in north-western Germany. Those taken comprised *P. leucopodia* (Htg.), *P. saxeseni* (Htg.), *P. compressa* (Htg.), *P. ambigua* (Fall.), *Nematus* (*Holcocneme*) *insignis* (Htg.), *Pachynematus scutellatus* (Htg.), *P. montanus* (Zadd.), *P. pallescens* (Htg.) and *P. nigriceps* (Htg.), and the larvae of all of them were reared on spruce in the laboratory. Those of *N. insignis*, which is rarely mentioned in the literature, and *Pristiphora leucopodia* are described. The relative abundance of the larvae of the species named and of *Gilpinia* spp. in 1950–51 is shown in a table, from which it appears that *Pachynematus* spp. were the most abundant.

Blanck (A.). **La mouche des fruits** (*Ceratitis capitata*) **hiverne-t-elle en France?**—*Phytoma* **5** no. 39 pp. 13–17, 3 figs., 16 refs. Paris, 1952.

Ceratitis capitata (Wied.) is a widespread pest of fruits in France, but is shown from a map [*cf. R.A.E.*, A **40** 203] to be at the northern limit of its distribution there, and it is not known whether it overwinters in that country or is reintroduced each year with imported fruits. Infestation was noticeably reduced during the war years, but has increased since, with the resumption of fruit imports, and reinfestation is reported to have occurred first in orchards near towns, though annual infestations in some isolated orchards seem to indicate that the pest overwinters locally. The author briefly describes the bionomics of the fly and discusses, from the literature, the climatic factors limiting its development [*cf.* **20** 124] and the effects of temperature on the individual stages [*cf.* **23** 605; **26** 325, 407; **30** 402; **38** 475]. From consideration of these factors, he distinguishes four main zones in eastern France differing in their ability to permit winter survival. The first comprises the Côte d'Azur, where the average temperatures at Antibes are 9·5°C. [49·1°F.] in December, 8·2°C. [46·76°F.] in January and 9°C. [48·2°F.] in February, and are thus above the minimum for adult survival, and late fruits such as persimmon allow development to be completed late in the year [*cf.* **27** 195], and also part of Roussillon. Between these two areas, conditions may resemble those in Tuscany described by Melis [**23** 61]. The second zone extends northwards from the Côte d'Azur to about Montélimar, and here the last larvae of the year would give rise to adults too early for these to survive the cold. In the third, comprising mainly the Rhône valley, Aquitaine and the Parisian region [*cf.* **22** 118; **26** 416], though the temperature of the soil is below the threshold of development, the pupae could survive the winter and give rise to adults in spring, while in the fourth, further north still, no stage could survive the winter. The situation in western France is less clear, but conditions there would seem to preclude the establishment of the fly.

Barnes (H. F.). **Description of the new Gall Midge found by M. R. Pussard on Lavender, together with Notes on the Damage caused by some other Species (Dipt. Cecidomyidae).**—*Bull. Soc. ent. Fr.* **58** no. 8 pp. 125–128, 6 refs. Paris, 1953. (With a Summary in French.)

Pussard (R.). **Un nouveau ravageur des lavandes** *Thomasiniana lavandulae* **Barnes (Dipt. Cecidomyidae).**—*T.c.* pp. 128–130, 3 refs.

In the first paper, the Cecidomyiid, *Thomasiniana lavandulae*, sp.n., is described from two males, a female and four larvae reared from lavender collected at Allemagne (Basses Alpes) in 1938–39. The larvae develop beneath the bark, and damage to other plants by Cecidomyiids with similar habits is reviewed [*cf. R.A.E.*, A **40** 256].

It is stated in the second paper that damage to the lavender (a natural hybrid between *Lavandula vera* (*officinalis*) and *L. spica* (*latifolia*)) was first observed in May 1938. The presence of the colonies of larvae beneath the bark caused the appearance of darkened sunken patches, a greying of the foliage and a reduction in new shoots and flowers. Infestation occurred on both young and old plants and appeared to be commonest in valleys and on low ground. At an altitude of about 1,650 ft., larvae were numerous in April and May, became considerably less common in early June and were very scarce after mid-June. There appeared to be only one generation a year, and the adults probably emerge in March or April, oviposition beginning a few days later. *T. lavandulae* was also observed in Drôme,

and *L. spica* and *L. vera* as well as the hybrid were subject to attack. It may, therefore, be of economic importance throughout the mountainous regions of Provence where lavender is cultivated.

KAY (K.) & others. **Parathion Exposure and Cholinesterase Response of Quebec Apple Growers.**—*A. M. A. Arch. industr. Hyg.* **6** pp. 252–262, 11 refs. Chicago, Ill., 1952.

In the experiments described, which were carried out in 1951, apple orchards in Quebec were sprayed with 0·75–1·5 lb. 15 per cent. wettable parathion per 100 gals. at the rate of 300–400 gals. per acre at 10-day intervals from early May to the end of June. The concentration of parathion in the air within a few feet of the breathing zone of the spray operator was found to vary from 2 mg. per cu.m. when the spray was applied down-wind under low wind velocity to 15 mg. when it was applied into the wind. High concentrations generally occurred during windy conditions, when contamination of skin and clothing was also high. Residual parathion was present in the air in very small quantities throughout the period [*cf. R.A.E.*, A **41** 137]. Residues on leaves and fruit were not investigated, but may be of importance during thinning operations. Tests made when the parathion powder was being added to the spray tanks showed 16–26 mg. parathion dust per cu.m. in the breathing zone when the wind velocity was 6 miles per hour, but in view of the short time taken to fill the tanks and the speed with which the dust cloud is carried past, exposure during filling is considered to be of little importance.

The blood cholinesterase levels in a group of 33 young adult workers exposed in the orchards during the spraying periods, as determined by an adaptation of the Michel test, were compared with those in a similar group not so exposed. In the latter, the average plasma values were 0·82–0·88 and the average red-cell values 0·78–0·8 in August and October 1951 and February 1952, whereas in the former, the average plasma values were 0·78 after two spray applications, 0·74 at the end of the spray period and 0·85 in October, and the corresponding red-cell values 0·65, 0·64 and 0·81. About half the exposed individuals reported no symptoms of ill health, and the others various non-specific symptoms, with a few cases of illness of short duration, and there was a significant difference between these groups in plasma cholinesterase levels in June, but not in October, but no significant differences in red-cell cholinesterase. There was no significant difference in either plasma or red-cell cholinesterase levels between individuals who used respirators and those who did not, largely owing to poor maintenance of the respirators.

Although clinical examination did not yield positive diagnosis of parathion poisoning in the absence of blood findings, study of the cholinesterase changes in some cases indicated that poisoning had occurred. However, it is emphasised that the diagnostic value of the cholinesterase test is doubtful unless changes are considerable or statistical data are available. It is concluded that careful precautions and medical supervision of exposed persons are of value in eliminating the danger of poisoning [*cf.* **40** 104].

CLABORN (H. V.), BOWERS (J. W.), WELLS (R. W.), RADELEFF (R. D.) & NICKERSON (W. J.). **Meat Contamination from Pesticides.**—*Agric. Chem.* **8** no. 8 pp. 37–39, 119, 121, 10 refs. Baltimore, Md., 1953.

As chlorinated hydrocarbons applied to forage crops may persist in the meat of animals fed on them, experiments were carried out in which sheep

and cattle were fed with known doses of insecticides, and the amounts stored in the fat were determined at intervals. DDT, p,p′methoxy-DDT (methoxychlor), toxaphene, chlordane, BHC, dieldrin and aldrin were dissolved in acetone, mixed with the feed at various rates and supplied to the animals for periods of 4, 8 or 16 weeks (the longest time that cattle and sheep would be kept on feed when being finished for slaughter), and fat samples, obtained from the omentum of the living animal before and at intervals of about four weeks after feeding began, were analysed. Most of the rates tested were probably higher than would be encountered in actual practice.

Toxaphene at a rate of 100 parts per million in the feed resulted in the presence of 22 p.p.m. in the fat of sheep in four weeks, with no significant increase during a further 12 weeks, and in 33 p.p.m. in the fat of calves in eight weeks, with no increase during a further eight weeks. The amount was reduced to 12–14 p.p.m. in both lots of animals four weeks after the end of feeding and to zero eight weeks after it. Feeding with 25 p.p.m. for 16 weeks resulted in the presence of 7·5 and 11·5 p.p.m. in the fat of sheep and calves, respectively, and these small residues would probably have been eliminated in four weeks. Feeding with 10 p.p.m. for four weeks left no detectable residues.

Feeding with 100 p.p.m. BHC resulted in the storage of 120 p.p.m. in sheep in eight weeks, with no increase during the next eight weeks and a decrease to 32 p.p.m. and zero eight and 16 weeks after the end of feeding. The same dosage fed to calves caused a continued increase in the amount stored, which reached 250 p.p.m. at the end of 16 weeks, but there was a decrease to 84 and 22 p.p.m. eight and 24 weeks after the end of feeding.

Aldrin at 25 p.p.m. resulted in a continuous increase to an average maximum of 75 p.p.m. in eight weeks in calves, with a gradual decrease after the end of feeding to 9·5 p.p.m. 32 weeks after the end of feeding, and to one of 69 p.p.m. in eight weeks in sheep, with a reduction to 32 p.p.m. 20 weeks after the end of feeding; the high residues in sheep were confirmed by analysis of the fat of animals slaughtered 36 weeks after the end of feeding. Feeding with 10 p.p.m. caused storage of 53 p.p.m. after eight weeks, with no increase during the next eight weeks, in sheep, and of amounts increasing gradually to 49 p.p.m. after 16 weeks in calves. Feeding sheep with 5 p.p.m. aldrin caused the storage of amounts increasing to 17 p.p.m. in 12 weeks with no increase during a further four weeks, and feeding calves and sheep with 5 p.p.m. technical aldrin (3 p.p.m. aldrin) caused gradual increases to 13 p.p.m. in 12 weeks and to 10 p.p.m. in 16 weeks, respectively. Dieldrin was supplied only at 25 p.p.m., with results similar to those obtained with aldrin.

No detectable residue was present in the fat of sheep or calves that had been fed with 10 p.p.m. methoxy-DDT for four weeks, but sheep contained 3·1 and calves 6·8 p.p.m. after similar feeding with DDT. Feeding with 25 p.p.m. chlordane for eight weeks resulted in an average maximum of 18·5 p.p.m. in calves and 12·5 p.p.m. in sheep, with elimination in 20 and 4 weeks, respectively, and feeding with 10 p.p.m. for 16 weeks in 11 p.p.m. after four weeks in calves and 16 p.p.m. after eight weeks in sheep.

Methoxy-DDT thus caused no detectable residue, and toxaphene the lowest found, followed in ascending order by DDT, chlordane, dieldrin, aldrin and BHC; the rate of elimination was directly related to the amount stored.

Crabtree (D. G.) & Robinson (W. H.). **Pivalyl, the new insecticidal Rodenticide.**—*Pest Control* **21** no. 7 pp. 22, 24, 58, 7 refs. Painesville, Ohio, 1953.

The use of anticoagulant baits on a cereal base for the control of rodents in the United States, usually necessitating a continuous baiting period of 10–30 days, was found to be complicated by insect infestation, which resulted in the destruction of the baits and in the introduction of harmful insects into hitherto uninfested premises. Attempts were therefore made to find a compound that would control grain insects at a concentration of not more than 0·025 per cent. and also act as a rodenticide. Field tests of cereal baits containing 0·025 per cent. 2-pivalyl-1,3-indandione between February 1952 and January 1953 showed that this gave good control of rodents and resisted invasion by insects and fungi. After exposure for three months in Louisiana, only 11 of 550 baits contained insects, many of which had been killed. Most of the contaminated baits had been exposed to heavy infestations in rice mills, and the insects found in these included the Mediterranean flour moth [*Ephestia kuehniella* Zell.], the red rust flour beetle [*Tribolium castaneum* (Hbst.)], the saw-toothed grain beetle [*Oryzaephilus surinamensis* (L.)], the rice weevil [*Calandra oryzae* (L.)], the cornsap beetle [*Carpophilus dimidiatus* (F.)], the angoumois grain moth [*Sitotroga cerealella* (Ol.)], the cadelle [*Tenebroides mauritanicus* (L.)] and the lesser grain borer [*Rhizopertha dominica* (F.)].

Judenko (E.), Johnson (C. G.) & Taylor (L. R.). **The Effect of *Aphis fabae* Scop. on the Growth and Yield of Field Beans in a Garden Plot.**—*Plant Path.* **1** no. 2 pp. 60–63, 1 pl., 1 graph. London, 1952.

Aphis fabae Scop. often causes complete loss of crop of field varieties of broad beans in Britain, but little is known of the effect of less severe infestation. This was investigated in southern England on tick beans grown in a sheltered garden in 1948, alternate plants being protected from infestation by hand collection and the use of nicotine sprays. The first migrants arrived on 8th May, and 87 per cent. of the experimental plants were infested by 13th May; attack was relatively light, and maximum infestation of short duration. By 29th June, the mean total length of stem and the mean number of stems produced per infested plant showed significant reductions of 22 and 11 per cent., respectively, but growth continued after the Aphids disappeared in early July, so that the final difference between mean total stem length on infested and uninfested plants was reduced to 9 per cent., and the infested plants tended to have more stems than the controls. The plants were dried under cover from early September until 1st October, and the pods examined in the following January, when the mean weight of beans per plant from the infested plants was 43 per cent. lower than that from the controls. In addition, the numbers of pods and beans per plant and of locules per pod and the size of the beans on infested plants were reduced by 38, 39, 2 and 7 per cent., respectively. Infested plants showed more variation in size of plants and weight of beans produced, and uninfested ones in size of beans. Some large, very heavily infested plants were almost as productive as similar control ones, which suggested that individual plants may be resistant to attack. Significant positive correlations were found in infested plants between mean individual stem length per plant and degree of infestation and between yield and both total stem length and number of stems per plant.

Freeman (J. A.). *Laemophloeus* **spp. as major Pests of stored Grain.** —*Plant Path.* **1** no. 3 pp. 69–76, 1 pl., 16 refs. London, 1952.

The author reviews numerous cases that have occurred since 1940 of infestation of grain stored in England, Scotland and Northern Ireland in which the principal or only insects involved were species of *Laemophloeus* [*cf. R.A.E.*, A **36** 418; **38** 308; **40** 362] and discusses the factors that favour the development of these Cucujids. Most of the infestations were in Manitoba wheat that had been stored for long periods in large, shallow heaps on floors or, on occasion, in silos, though wheat originating elsewhere and barley and maize were also affected, and the species concerned were primarily *L. ferrugineus* (Steph.) and *L. minutus* (Ol.). It is concluded that the outbreaks, which resulted in heating and caking of the grain and the development of moulds, were caused by endemic populations. Heating became obvious only after the grain had been in storage for periods ranging from five months to three years, and this is attributed to the fact that grain is frequently stored in Britain at temperatures below 60°F., whereas both species of *Laemophloeus* develop slowly at temperatures below 70°F. Manitoba wheat generally has a moisture content of 12–13 per cent. on arrival and mortality among first-instar larvae of *L. minutus* is high in grain of which the moisture content is less than 22 per cent. [*cf.* **37** 327], though *L. ferrugineus* is more tolerant of dry conditions [*cf.* **38** 159]. High moisture content may arise locally, however, as a result of leaks in roofs, defects in floors and walls, the admixture of damp grain, or the movement of water within the mass owing to differences in temperature between the grain and the floor or other surfaces with which it is in contact, but there was no evidence of damp spots in some of the outbreaks described. Infestation is difficult to detect, since the adults feed within the grains and the whole of the larval and pupal stages can be passed in them.

Infestation can readily be controlled in suitable silos, but not in grain stored in bulk on floors, especially where there are steep temperature gradients. Recent work in Britain has shown, however, that general or spot fumigations with carbon tetrachloride alone or mixed with ethylene dichloride are effective; methyl bromide is of no value owing to poor distribution. In one of the infestations described, the insects apparently survived two treatments with a BHC smoke and one with hydrocyanic acid gas.

Moreton (B. D.) & Light (W. I. St. G.). **Control of Cabbage Root Fly with BHC and Tar Oil Wash.**—*Plant Path.* **1** no. 4 p. 121. London, 1952.

BHC and a tar-distillate winter wash were compared for the control of *Hylemyia* (*Erioischia*) *brassicae* (Bch.) [*cf. R.A.E.*, A **41** 5] on cabbage in 1950 in experimental plots on a farm in south-eastern England on which losses frequently amounted to 40 per cent. The tar distillate was used at a concentration of 0·5 per cent., and 50 per cent. wettable BHC at 1 or 2 oz. per 5 gals. water, and both were applied to the soil at the base of the plants at the rate of 1 fl. oz. per plant on 2nd May, when oviposition had already begun; half of each of the plots treated with BHC received a second application on 23rd May. On 29th June, the plant stands on plots treated with BHC were almost complete, whereas losses in the untreated plots amounted to about 50 per cent. and in plots that received tar distillate to rather less. Incomplete data at harvest indicated that the yield was probably trebled in weight on the plots treated with BHC. Two applications were not appreciably superior to one, and infestation by *Brevicoryne brassicae* (L.) in late June was least severe on crops treated with BHC. The tar

distillate caused yellowing of the foliage and temporary retardation of growth, which was followed by intensified flea-beetle attack.

The rest of the crop was successfully treated by the grower with BHC at 2 oz. per 5 gals., and a fruit-spraying machine having two lances with trigger releases, on each of which one nozzle was blocked and the other removed, was successfully used to apply about 1 fl. oz. per plant.

Stroyan (H. L. G.). **The Identification of Aphids of economic Importance.** —*Plant Path.* **1** nos. 1–4 pp. 9–14, 42–48, 92–99, 123–129, 2 pls., 16 figs., refs. London, 1952.

The first four parts of this paper are devoted to brief descriptions of the 16 Aphid genera considered of greatest economic importance in Britain, with figures of diagnostic characters and notes on the plants with which they are associated and the food-plants and distinguishing characters of the important species. The last part contains a key to the apterous viviparae, other than fundatrices, of upwards of 50 genera that are most likely to be encountered by economic entomologists.

Lee (N. R.). **Note on a Plum Cambium Miner (Agromyzidae).**—*40th Rep. E. Malling Res. Sta. 1951–52* pp. 78–79, 1 pl., 9 refs. East Malling, 1953.

The following is virtually the author's summary. A description is given of damage to young plum trees caused by the larvae of an unidentified species of *Phytobia* (*Dendromyza*) not previously recorded in the British Isles. The feeding of the larvae in the cambium causes mines which subsequently become occluded and form pith flecks in the wood; the development of these pith flecks is described.

Paine (J.). **Insect Vector Studies with Mosaic and other Virus Diseases of the Hop.**—*40th Rep. E. Malling Res. Sta. 1951–52* pp. 120–122, 1 pl., 7 refs. East Malling, 1953.

Experiments were begun at East Malling in 1948 to investigate the mode of spread of hop mosaic and other virus diseases of hops. When ten potted plants of a variety susceptible to the mosaic virus were exposed each month in hop gardens of susceptible varieties, two exposed in June and one exposed in July developed mosaic symptoms. Of the numerous insects that occur on hops [*cf. R.A.E.*, A **41** 306], only *Anthocoris nemorum* (L.), *Longitarsus parvulus* (Payk.), *Macrosiphum solanifolii* (Ashm.) (*euphorbiae*, auct.), *Phorodon humuli* (Schr.), *Psylliodes attenuata* (Koch) and unclassified Capsids and Coccinellids were present between May and July in both 1950 and 1951 in gardens in which infection was spreading.

All insects collected during the growing season of 1950 at sites in which mosaic was spreading were tested as vectors by placing those collected in an hour, once a month, first on infected plants in the greenhouse and then on susceptible plants, all of which were reinfested several times. Nine species and soil from round infected plants were used in various combinations so that no two plants received the same treatment, and only *Phorodon humuli*, of which alates were used, was common to the two plants that developed symptoms of mosaic in 1950, the two that developed them in 1951 and four that showed symptoms of split leaf blotch (a virus disease common in the Fuggle variety). In 1951, alates of *P. humuli*, collected from hops and various species of *Prunus* and kept for six weeks in a greenhouse containing

ten mosaic-infected and ten healthy hop plants, planted in pairs in pots, caused the appearance of a line-pattern, apparently a virus symptom, on nine of the healthy plants and symptoms of mosaic on four, including the one that did not show the line-pattern. The control plants remained without symptoms.

In the mass-infestation experiment in 1950, two of the plants that became infected with mosaic and one of those that developed split leaf blotch had been infested with both *P. humuli* and *M. solanifolii*, and in 1951, over 1,000 apterae of the latter were transferred repeatedly between ten mosaic-infected and ten healthy plants, planted in pairs in pots in the greenhouse, with the result that three healthy plants developed line-pattern symptoms after three months. The healthy plants were set in the open in 1952, and two developed mosaic symptoms, in May and July, respectively; no symptoms were seen on the uninfested controls.

COLLYER (E). **The Effect of Spraying Materials on some predatory Insects.** —*40th Rep. E. Malling Res. Sta. 1951–52* pp. 141–145, 10 refs. East Malling, 1953.

Investigations were carried out in Essex in 1947–52 on the effects of pest-control materials on predators of the fruit-tree red spider mite [*Paratetranychus pilosus* (C. & F.)] in orchards that had been sprayed for many years [*cf. R.A.E.*, A **42** 130, etc.].

There is much evidence that winter sprays are harmful to some of the predators, but treatment with tar distillate, followed by a spring application of DNC, had little effect on overwintering eggs of the Mirid, *Blepharidopterus angulatus* (Fall.). In plots in which winter oil was applied as 3–5 per cent. stock emulsion or miscible oil on 17th March 1947 against the winter eggs of the mite and only lead arsenate and nicotine during the summer, there were no significant differences on 23rd June in the numbers of nymphs of *B. angulatus* on treated or untreated trees, and in 1948, treatment with 6 per cent. tar distillate on 15th January or with 3 per cent. oil, with or without DNC, on 4th February or 22nd March also had no significant effect, but in 1949, a spray of 4·5 per cent. oil with DNC on 22nd March resulted in smaller numbers of nymphs than the oil alone on 22nd March, 6 per cent. tar distillate on 14th January or no treatment, though hatching was not affected. In this case, the mixture of DNC and oil probably killed some of the winter eggs of the mite, thus reducing the population of the latter and resulting in higher natural mortality of *B. angulatus*. *Conwentzia pineticola* End., which becomes abundant in some years, particularly when the summer is warm and dry, overwinters in the prepupal stage in cocoons on the trunks or branches, and observations in the winter of 1947–48 showed that the percentage emergence of this Coniopterygid was reduced from 57 to 6 by sprays, other than those containing DDT, applied during the growing season.

There is little published evidence as to the effect on the predators of sprays, other than those containing DDT, applied during the growing season. Lime-sulphur kills predacious Laelaptid mites, which are therefore rarely abundant in commercial orchards, but it has little effect on insect predators, though, like nicotine, it kills a few of the young nymphs of *B. angulatus*. One application of derris (to give 0·004 per cent. rotenone) in summer oil (0·5 per cent.) on 18th June 1947 reduced the numbers of nymphs of *B. angulatus* from 262 per plot on untreated trees to 33 on treated ones by 14th July, and in the same year, sprays containing the same concentration of rotenone in derris wettable powder killed many newly hatched nymphs, though they caused less mortality than derris in oil. In 1948, 0·05 per cent. DDT applied to apple at petal-fall (13th May) or later caused considerable

reductions in numbers of *B. angulatus* and *Orius majusculus* (Reut.) on 24th June and 22nd July, and applications on 8th April had considerable effect at the earlier date and some on the later. Treatment with 2·5 lb. DDT (wettable) per 100 gals. on 1st July 1949 killed all nymphs of *B. angulatus* in four days and kept predators from the trees until the end of July, when small numbers of *Anthocoris nemorum* (L.) and *O. majusculus* appeared. *P. pilosus* increased rapidly on the sprayed trees and caused severe leaf bronzing in August and defoliation in September, but became rare on untreated trees.

Parathion causes initial destruction of *P. pilosus*, but results in a later increase, since it has a residual effect against many predators, but not against the mite. It kills all the important predators of *P. pilosus* at the usual strength of 0·01 per cent., and when applied at 0·06 per cent. on 1st June 1949, reduced the numbers of nymphs of *B. angulatus* per tree on 8th June and 14th July from 708 and 813 to 1 and 13, respectively. At 0·01 per cent., it is toxic to newly hatched nymphs of *B. angulatus* for 14–20 days and to adults of this and other Mirids and Anthocorids for at least ten days; it has a similar effect on *Stethorus punctillum* Weise and *Oligota flavicornis* Erichson, but adults of *Coccinella septempunctata* L. survive on foliage sprayed 2–3 days previously. In 1950, applications of 1, 2 or 4 lb. 50 per cent. wettable BHC per 100 gals. on 26th June affected all the important insect predators and showed some residual effect against adults and immature stages of *A. nemorum*, *Orius majusculus* and *Oligota flavicornis*, but not against those of *S. punctillum*.

Dicker (G. H. L.) & Briggs (J. B.). **Studies on Control of Apple Sawfly, *Hoplocampa testudinea* (Klug). I. Effect of Time of Spraying.**—*40th Rep. E. Malling Res. Sta. 1951–52* pp. 151–155, 8 refs. East Malling, 1953.

An account is given of experiments carried out in south-eastern England in 1949–51 in which single sprays were applied for the control of *Hoplocampa testudinea* (Klug) on apple at 80 per cent. petal-fall or during the following fortnight [*cf. R.A.E.*, A **41** 402, 403; **42** 129]. Sodium dioctyl sulphosuccinate at 0·0125 per cent. was added as wetter to all sprays containing nicotine and to the lower concentration of parathion used in 1949, and a fungicide, consisting of 1 per cent. lime-sulphur in 1949 and 0·4 per cent. dispersible sulphur in 1950 and 1951, to all sprays, the control plots being sprayed with the fungicide alone when the earliest insecticidal spray was applied. Fallen fruits were collected twice a week from early June to late July, when all infested fruits had fallen and the apples remaining on the trees were counted.

In 1949, when hatching began on 14th–17th May, reached 50 per cent. on 22nd May and finished by 28th May, applications of 0·0025 and 0·01 per cent. parathion on 13th, 17th, 20th, 23rd or 27th May all caused significant reductions in the percentage of infested fruits, and the higher concentration was significantly more effective than the lower on each date of application. The former gave 99 per cent. reduction when applied at any time during the fortnight and the latter about 96 per cent., with some indication that efficiency was decreasing at the last application.

In 1950, when hatching began on 23rd–25th May, reached 50 per cent. on 27th May and finished on 2nd June, applications of 0·005 per cent. parathion, alone or with 10 parts per million α-naphthaleneacetic acid, on 17th, 22nd, 26th or 31st May and of 0·05 per cent. nicotine on all but the last date caused significant reductions (approximately 90 per cent.) in infestation. The nicotine spray was completely ineffective on the last date. In

1951, when hatching began on 26th–29th May, reached 50 per cent. on 5th June and finished on 9th June, applications of 0·0075 per cent. parathion or 0·006 per cent. γ BHC on 26th May or 1st, 5th or 9th June all caused significant reductions in infested fruit, with no significant difference between times of application or between treatments, except that the earliest parathion spray was significantly better than the latest one of BHC on one of two apple varieties; parathion gave 94–100 per cent. reduction throughout the period, and BHC was equally effective until the last application, which showed a marked but scarcely significant drop in effectiveness on both varieties. Sprays of 0·05 per cent. nicotine were virtually ineffective on the first and last dates and gave 83–89 per cent. reduction on the others.

In a discussion of these results, it is pointed out that parathion gave consistently good results throughout, with some indication that low concentrations may be less effective when applied more than ten days after 80 per cent. petal-fall. BHC gave similar control when applied within ten days of petal-fall, and nicotine was most effective when used five or ten days after it. All concentrations of parathion and 0·006 per cent. γ BHC gave consistently good results when applied from about four days before hatching began to the time of 50 per cent. hatch. The addition of a fungicide did not reduce the toxicity of any of the insecticides. Scarred fruits, in which the young larvae had been killed while tunnelling under the epidermis, were very scarce on trees receiving sprays less than ten days after 80 per cent. petal-fall, whereas a few occurred after most treatments made at that time and relatively large numbers after treatment four days later, indicating that few larvae had penetrated beyond the calyx by ten days after petal-fall. Death of tunnelling larvae is due to penetration of the epidermis by the insecticide, and parathion was slightly more effective than BHC against them, and both of these twice as effective as nicotine. Very marked increases in crop followed the use of parathion in 1949 and 1951.

Groves (J. R.) & Tew (R. P.). **Preliminary Trials for the chemical Control of the Summer Fruit Tortricid.**—*40th Rep. E. Malling Res. Sta. 1951–52* pp. 156–158, 5 refs. East Malling, 1953.

Experiments were carried out in 1952 on the control of *Adoxophyes orana* (Fisch. v. Roesl.) on apple in south-eastern England [*cf. R.A.E.*, A **41** 303]. Against larvae of the overwintering generation, a spray containing 0·1 per cent. DNC and 4 per cent. oil, with or without 0·1 per cent. wettable DDT, was applied at the delayed dormant stage, on 11th March, and one of 0·1 per cent. DDT at the green-cluster stage, on 16th April. The larvae left their hibernation quarters during the first three days of April, and observations made just after petal-fall, on 9th and 10th May, showed that treatments at the delayed-dormant stage only, at the green-cluster stage only, and at both, all gave significant but not adequate reductions in larval population, with no significant difference between them, though there were indications that neither DNC and oil without DDT nor DDT alone was as effective as all three, applied together or in succession.

Against the first generation, sprays of 0·01 per cent. parathion or 0·15 per cent. toxaphene were applied on 5th June only or on 5th and 23rd June, and one of 0·1 per cent. DDT with 0·01 per cent. parathion on 5th June. The records at East Malling showed that moth flight began on 27th May and continued until 20th June; the flight period was about the same in the test orchard, and the eggs are normally laid a few days after emergence and hatch in 10–14 days. Examination of fallen and harvested fruits showed

significant reductions in crop damage from all treatments except one application of parathion, which gave good immediate control but permitted reinfestation.

It is concluded that the early treatment with DNC and oil, DDT or both, followed by two summer applications of parathion or toxaphene or one of DDT and parathion should give considerable control.

COLLYER (E.). **The Greenhouse Red Spider Mite, *Tetranychus urticae* Koch, on Apples in East Anglia.**—*40th Rep. E. Malling Res. Sta. 1951–52* pp. 159–160, 3 refs. East Malling, 1953.

Paratetranychus pilosus (C. & F.) (*Metatetranychus ulmi*, auct.) is the only Tetranychid of economic importance on apple in England, but *Tetranychus telarius* (L.) (*urticae* Koch) was observed on apple and pear in August and September 1949 in an Essex orchard that had been treated with parathion, and increased in numbers each year from 1950 to 1952, after increasing numbers of parathion sprays. It was common on hedgerow plants and weeds in early summer and moved to apple in July. It was subsequently observed in other orchards, on apple, pear, plum, cherry and walnut, but occurred on fruit trees only where parathion had been applied, and its increase is possibly due to the killing of its predators in the hedgerows by sprays. In 1952, the first females were found on apple in mid-May and seven generations were completed in an unheated laboratory before the overwintering females developed in October.

Statens Skadedyrlaboratorium. Årsberetning 1950–1951. [Government Pest Infestation Laboratory (Stored Products and Household Pests). Annual Report 1950–51.]—45 pp., 5 figs. Springforbi, 1953. (With Summaries in English.)

In addition to information noticed elsewhere [*R.A.E.*, B **42** 93], this further report from Denmark [*cf.* A **40** 218, etc.] contains the results of additional surveys of pests of stored grain. The distribution of *Calandra granaria* (L.) was irregular, but appeared to be closely related to the amount of wheat and barley grown and stored. Infestation was greater on farms than on smallholdings, and though old buildings showed greater infestation than new ones, there was no relation with cleanliness. *Endrosis sarcitrella* (L.), which is rare except when the grain is damp [*cf.* **38** 459], was found in 1950 infesting barley, oats and rye in six government stores, in spite of a dry harvest in 1949. The water content of the infested grain was high, apparently owing to threshing in the field before drying, leaky roofs, and storage against outer walls.

Distribution Maps of Insect Pests.—Series A, nos. 37–42. London, Commonw. Inst. Ent., 1954.

These maps are nos. 37–42 of a series already noticed [*R.A.E.*, A **40** 203; **41** 438] and deal, respectively, with *Brevicoryne brassicae* (L.), *Lygus lineolaris* (P. de B.) (*oblineatus* (Say)), *L. pratensis* (L.), *Eurygaster integriceps* Put., *Cosmopolites sordidus* (Germ.) and *Hylotrupes bajulus* (L.).

Thorsteinson (A. J.). **The chemotactic Responses that determine Host Specificity in an oligophagous Insect** (*Plutella maculipennis* (**Curt.**) **Lepidoptera**).—*Canad. J. Zool.* **31** no. 1 pp. 52–72, 32 refs. Ottawa, 1953.

The following is substantially the author's abstract. The mustard-oil glucosides, sinigrin, sinalbin and glucocheirolin, and the mustard oil, allyl isothiocyanate, as well as the enzyme myrosin, were prepared from the seeds of cruciferous plants. Larvae of *Pieris brassicae* (L.) and *Plutella maculipennis* (Curt.) were induced to feed on plants that they normally refuse by painting the leaves with a solution of sinigrin or sinalbin, but they would not feed on such leaves treated with allyl mustard oil. The feeding responses of *P. maculipennis* were tested on agar gels containing the powdered, dehydrated leaves of various plants alone and in combinations with the glucosides, mustard oil and myrosin, and the amount of feeding was estimated by counts of the frass pellets produced during the test period. It was shown that sinigrin, sinalbin and glucocheirolin are feeding stimulants. Since the larvae feed readily on at least 40 plant species reported to contain mustard-oil glucosides, it was concluded that these glucosides are specific feeding stimulants. The threshold concentrations for gustatory perception under these conditions were of the order of two parts per million for sinigrin and about 20 p.p.m. for sinalbin. Optimum feeding responses were obtained only when the glucoside was offered in a medium containing other nutrients in the form of powdered, dehydrated leaves or artificial mixtures. In some experiments, the addition of allyl mustard oil slightly increased feeding on media containing sinigrin. The addition of viable myrosin to diets containing sinigrin decreased feeding. Since heat-killed myrosin had no repellent effect, it appears that the action of myrosin is due to the depletion by hydrolysis of the quantity of sinigrin in the medium. Apparently the products of the hydrolysis, including mustard oil, are less attractive than the parent glucosides. Since hydrolysis of glucoside will release only minute amounts of mustard oil in the short time intervening between biting and swallowing, it is unlikely that the gustatory receptors will be exposed to appreciable concentrations of mustard oil relative to glucoside. On the other hand, it is possible that infinitesimal amounts of mustard-oil vapour emanating from leaves may stimulate the olfactory sense, which is characteristically extremely sensitive in insects. While hunger induces sustained feeding in the absence of mustard oil provided that a gustatory stimulant is present, such an olfactory stimulus might conceivably initiate feeding more promptly. This would account for the observation in some experiments that larvae produced more frass when feeding on media containing a little mustard oil as well as sinigrin. The power of sinigrin to induce *P. maculipennis* to feed on nutrient media makes possible the development of an artificial medium for studies of its nutrition.

Langenbuch (R.). **Ist das Fehlen eines " Fraszstoffes " oder das Vorhandensein eines " Vergällungsstoffes " die Ursache für die Resistenz der Wildkartoffel** *Solanum chacoense* **Bitt. gegenüber dem Kartoffelkäfer? Zugleich ein Beitrag zur Frage der Monophagie des Kartoffelkäfers.** [Is the Lack of a Feeding Stimulant or the Presence of a Repellent the Cause of Resistance of the wild Potato, *S. chacoense*, to the Potato Beetle? A Contribution to the Question of the Monophagy of the Potato Beetle.]—*Z. PflKrankh.* **59** pt. 5–6 pp. 179–189, 8 figs., 6 refs. Ludwigsburg, 1952. (With a Summary in English.)

An account is given of experiments carried out in Germany with potato and selected strains of *Solanum chacoense* to discover whether resistance

in the latter to *Leptinotarsa decemlineata* (Say) is due to the lack of an attractant that exists in potato or to the presence of a repellent [*cf. R.A.E.*, A **41** 249]. Disks were cut from leaves of the two plants and fastened on one another, usually in pairs, with a paste made of potato flour and water or sap expressed from the leaves. Beetles were starved for at least 48 hours and then allowed to feed on the prepared disks. The disks from the leaves of potato were cut so as to project slightly when superimposed on those of *S. chacoense*, in order to encourage feeding, and several combinations of disks and paste mixtures were tested. Since the leaves of *S. chacoense* appeared tougher and more difficult to chew, experiments were also carried out with the expressed sap only, which was introduced into potato leaves by centrifuging.

The results of the various experiments, which are discussed in detail, showed that the presence of potato leaves or sap from them did not increase feeding on *S. chacoense*, whereas sap from the latter applied to potato in the paste or by centrifuging considerably reduced feeding. Treatment with activated charcoal deprived the sap of its repellent properties. Acetaldehyde has been claimed to be an attractant in potato leaves [*cf. loc. cit.*], but leaves of *S. chacoense* treated with a weak solution by centrifuging were even less consumed than untreated leaves.

Görz (B.). **Die Bekämpfung der Gallicolen von** *Phylloxera vitifolii* **Fitch.** [The Control of Gallicolae of *P. vitifoliae*.]—*Z. PflKrankh.* **59** pt. 5–6 pp. 189–198, 4 figs., 11 refs. Ludwigsburg, 1952. (With a Summary in English.)

Fundatrices of *Phylloxera vitifoliae* (Fitch) are not found on the leaves of vines of European origin, but they and gallicolae of race *vitifoliae* [*cf. R.A.E.*, A **33** 124, etc.] are present in western Germany on the leaves of American vines and hybrids, particularly in nurseries for grafting stock. Heavy infestation weakens the plants and reduces the quantity of wood available for root stocks, and their presence constitutes a threat to European vines, the roots of which are infested by the forms that emerge from the leaf galls, especially in autumn. To obviate the danger of spread, treatment against the winter eggs of *P. vitifoliae* is compulsory in grafting-stock nurseries in Germany. Very good results are given by tar distillates (fruit-tree carbolineums), but complete mortality cannot be ensured and vines on which gallicolae develop have to be removed, together with any uninfested plants within a radius of 27 yards. Because of the hardship entailed [*cf.* **40** 373], particularly when infestation is slight though widespread, and because the ovicidal spray must be applied each year although it is not always necessary, experiments on control of the gallicolae were carried out in 1948–51.

Technical BHC, DDT and E 605 f [a parathion emulsion concentrate] gave little or no control in preliminary tests, but in view of promising results with γ BHC and the systemic insecticides, Systox [O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate] and Pestox 3 [which contains schradan (*cf.* **40** 290)], these were investigated further in 1951. In one test, sprays were applied to infested vines on 31st July, and leaves were removed on 6th August and the galls examined for mature Aphids. The results showed that γ BHC gave complete or almost complete mortality in a proprietary emulsified solution at all concentrations tested, but was slightly less effective in a suspension, and that 0·1 per cent. Systox and Pestox 3 gave 42 and 12 per cent. mortality, respectively. None of the materials killed the eggs in the galls. In another test, in which sprays of the same materials with the exception of the BHC suspension were applied on 3rd

July and the galls on the nine youngest leaves counted 24 days later, 0·5 per cent. Systox gave good results and Pestox 3 was again the least effective. The emulsion spray of γ BHC proved outstanding and completely controlled the Aphid at a suitable concentration. It is concluded that since effective summer treatment is possible, the destruction of the vines should no longer be required.

Becker (H.). **Untersuchungen über Rassenmerkmale bei Fundatrigenien der Reblaus** (*Phylloxera vitifolii* **Fitch**). [Investigations on racial Characters in Fundatrigeniae of *P. vitifoliae*.]—*Z. PflKrankh.* **59** pt. 5–6 pp. 198–209, 5 graphs, 26 refs. Ludwigsburg, 1952. (With a Summary in English.)

An account is given of morphological investigations on the races of *Phylloxera vitifoliae* (Fitch) present on the leaves of vines in a root-stock nursery in the German province of Baden. Leaf galls were collected from nine vines that were separated from one another by uninfested plants, and the eggs were allowed to develop in petri dishes. Neogallicolae-gallicolae were examined for classification according to Börner's index of the ratio of the length of the rostral setae to that of the hind tibia, which is greater in race *vastatrix* than in race *vitifoliae* [*cf. R.A.E.*, A **28** 327]. The indices obtained were all intermediate between those of the two races, with the exception of one that was higher than that of *vastatrix* and was obtained from examples from a hybrid vine considered immune from leaf infestation by that race. Neogallicolae-radicicolae were produced in numbers on one vine in July and on two others in early August. The index figures for these forms are rather higher than those for the neogallicolae-gallicolae, but of four strains of which the two forms were compared, one was close to *vitifoliae*, two were intermediate between the races, and the gallicolae of the fourth appeared to belong to race *vitifoliae* and the radicicolae to race *vastatrix*.

Periodical tests with a single strain showed that the index was not constant for either form. Attempts to alter it by changing the temperature at which the eggs were kept or exposing the eggs to light for varying periods were unsuccessful, but the index was much reduced in the second generation when development took place on shoots in lightproof bags. Aphids transferred from one variety of vine to another did not infest it with equal facility. The presence of physiological races was thus demonstrated, but they could not be identified with Börner's races.

Endrigkeit (A.). **Versuche zur vorbeugenden Kohlfliegenbekämpfung bei Kohlsetzlingen durch Wurzelbegiftung mit Schwermetallverbindungen und Kontaktinsektiziden.** [Experiments in preventive Control of *Hylemyia brassicae* on Cabbage Seedlings by Root Treatment with heavy Metal Compounds and Contact Insecticides.]—*Z. PflKrankh.* **59** pt. 5–6 pp. 209–220, 29 refs. Ludwigsburg, 1952. (With a Summary in English.)

The experiments described were carried out in 1946–51 on the west coast of Schleswig-Holstein to evaluate treatments for the protection of cabbage and cauliflower seedlings from infestation by *Hylemyia* (*Chortophila*) *brassicae* (Bch.). The roots and stalks of the seedlings were dipped before planting out in a 1 : 5 mixture of water and local clay, to which the insecticide was added immediately before use, or in emulsions or suspensions of the insecticides in water, or the roots were treated with an adhesive and dusted with the toxicant. The results are given in tables and discussed.

Compounds of mercury, copper or arsenic were toxic to the plants at insecticidal concentrations, as also was E 605 Staub [a dust of 2 per cent. methyl-parathion] at rates of over 1 lb. per 10 gals. This dust gave good results when used in the clay suspension in 1949 but not in the two following years, and it was unsatisfactory when applied directly to the base of the stalks after planting out. A dust of DDT (Gesarol) used in the same ways proved ineffective. Emulsion concentrates of E 605 [parathion] gave good protection for over two months when applied in the clay suspension, but lost their effectiveness in 2–3 weeks when diluted with water only. Three proprietary BHC preparations used in the same way were very effective, and the best of them, a γ BHC product designed for soil treatment, gave practically complete protection from infestation for over three months.

Creuzburg (U.). **Nochmals Abflammversuch gegen San José-Schildlaus.** [Further to Experiments in burning off San José Scale.]—*Z. PflKrankh.* **59** pt. 5–6 p. 223. Ludwigsburg, 1952.

It is pointed out with reference to the reported use of a flame-thrower to control heavy infestations of the San José scale [*Quadraspidiotus perniciosus* (Comst.)] on apple in Austria [*R.A.E.*, A **41** 437], that although the thickness of the bark may have protected the trees from injury, there is much young wood on old trees that is more susceptible. Official investigations were suspended because of the impossibility of measuring the treatment applied and of treating an entire tree to the same degree. The danger of over-stimulating dormant buds is stressed.

Tominić (A.). **Stjenica loznog cvijeta u vinogradima Konavlja.** [The Grape-vine Flower Bug in the Vineyards of Konavlje.]—*Plant Prot.* no. 5 pp. 3–12, 2 figs., 6 refs. Belgrade, 1951. (With a Summary in French.)

Injury to vines resulting in partial or complete loss of crop in a district near Dubrovnik was found in 1948–49 to be due to *Calocoris fulvomaculatus* (Deg.). This Mirid, the distribution of which is briefly reviewed, is favoured by high relative humidity, and it was commonest in low-lying vineyards and those adjoining land subject to flooding. The adult and nymph are briefly described. Hibernation occurred in the egg stage in cracks in the bark of the stocks, and the development of the eggs was not affected by immersion for several days in spring as a result of flooding. The nymphs hatched between mid-March and the beginning of June, sought the newly opened buds and punctured the young leaves, feeding chiefly at night and mostly sheltering during the heat of the day under loose bark. The older nymphs fed on the flowers. A toxic fluid was emitted during feeding, causing necrosis of the surrounding tissues, and injured leaves and flowers became crinkled and dried up. No grapes were produced under these conditions, but infested vines soon recovered and produced exuberant new growth. In glass jars, under almost optimum conditions, nymphal development was completed in about 20 days. The first adults were observed in the vineyards at the beginning of May, and all had disappeared by the first week in June. Only grape vines were attacked in the field, but in a greenhouse, at a somewhat higher temperature and relative humidity, the nymphs completed their development on willow and reached the fifth instar on nettle (*Urtica dioica*) and the fourth on potato.

Control measures are desirable in winter against the eggs and in spring against the young nymphs. In tests, sprays of 3 and 5 per cent. tar distillate

applied in January 1948 were ineffective. Of various materials applied in April, proprietary nicotine or pyrethrum sprays gave high mortality of the nymphs, and 0·1 per cent. nicotine sulphate with 1 per cent. white oil was particularly toxic, but the effect was short-lived; a sulphur spray was inferior. Preparations of DDT or BHC were also highly toxic, dusts being superior to sprays on account of their greater ability to penetrate cracks, and gave much more durable control, so that only two applications would be necessary.

Ilit' (B.). **Control of the Pea Bruchid with BHC.** [*In Serbian.*]—*Plant Prot.* no. 5 pp. 32–38. Belgrade, 1951. (With a Summary in French.)

Bruchus pisorum (L.) was very abundant in Yugoslavia in 1949 and caused much damage to stored peas. In experiments on control in the autumn, peas infested by it and beans infested by *B.* (*Acanthoscelides*) *obtectus* Say were dusted with Agrocide 7 [20 per cent. BHC] at rates of 1–6 : 1,000 by weight and kept in jars. Complete mortality was obtained, the BHC killing all the Bruchids that emerged from the seeds by contact and all those within them more slowly by fumigant effect. As there was little difference between the rates of application, the lowest is recommended. In comparative tests of contact and fumigant action, adults of the two species placed on lightly dusted paper were almost all dead in two days and those confined under a bell-jar (capacity 600 cc.) together with 0·5–1 gm. of the dust in a dish to which access was prevented all died in three days. *B. obtectus* proved the more susceptible in both tests.

In an experiment with infested peas stored for seed, treatment with a DDT dust killed the Bruchids that emerged from the peas but had no effect on those within. After a fortnight, various lots were dusted in a revolving drum with Agrocide 7 or Agrocide 2 [3·5 per cent. BHC] at 1–2 : 1,000 and poured into sacks. Flasks containing normal adults were inserted, and the sacks were tied at the top. Mortality was high in samples of the peas examined at intervals of about ten days and was complete or almost complete after six weeks, Agrocide 2 appearing to give the best results; it was also complete at that time in all the flasks except one that had been too tightly stoppered. Earlier examination had indicated that about 10 per cent. of the Bruchids were parasitised.

Tadit' (M.). **The Number of Generations of the Codling Moth in certain Fruit-growing Regions of Yugoslavia.** [*In Serbian.*]—*Plant Prot.* no. 5 pp. 44–49, 1 pl., 1 map, 6 refs. Belgrade, 1951. (With a Summary in English.)

Investigations in which trap bands were applied to apple trees in 17 fruit-growing districts throughout Yugoslavia in the spring of 1950 showed that *Cydia* (*Carpocapsa*) *pomonella* (L.) has two complete generations a year in all of them. A third possibly occurs in a few districts, but is of no economic importance [*cf. R.A.E.*, A **41** 104].

Nonveiller (G.). **Jedna kod nas malo poznata štetočina voćaka** *Ceresa bubalus* **F.** [*C. bubalus*, a Pest of Fruit-trees little known in Yugoslavia.]—*Plant Prot.* no. 5 pp. 67–72, 2 pls., 1 fig., 15 refs. Belgrade, 1951. (With a Summary in French.)

The author reviews data showing that *Ceresa bubalus* (F.), which was recorded from Yugoslavia for the first time in 1938 [*R.A.E.*, A **27** 474], has been present in that country since 1935, and possibly since 1934, occurring

throughout the southern area (with the possible exception of Montenegro, from which no information was available), and the central, eastern and north-eastern regions. The bionomics and European distribution of this Membracid are reviewed, all stages and the injury caused to fruit trees by its oviposition slits are described, and it is recommended that lucerne and clover should not be grown in orchards, as they are the preferred food-plants of the nymphs [*cf.* **27** 169].

Delucchi (V.). *Aphidecta obliterata* **L. (Coleoptera, Coccinellidae) als Räuber von** *Dreyfusia* (*Adelges*) *piceae* **Ratz.** [*A. obliterata* as a Predator of *Chermes piceae*.]—*Pflanzenschutzberichte* **11** pt. 5–6 pp. 73–83, 6 figs., 6 refs. Vienna, 1953. (With a Summary in English.)

In view of the injury caused to balsam fir [*Abies balsamea*] in eastern Canada by the introduced *Chermes* (*Dreyfusia*) *piceae* Ratz. [*cf. R.A.E.*, A **36** 208; **37** 12], investigations on the natural enemies of that Aphid on *A. alba* in central Europe were begun in 1950 with a view to the introduction of suitable species into Canada. The work was carried out in southern Germany, eastern Switzerland and the Vosges area of France, and ten species of predators were found, a list of which is given. The most important were the Coccinellids, *Scymnus* (*Pullus*) *impexus* Muls. and *Aphidecta obliterata* (L.), the Derodontid, *Laricobius erichsonii* Rosenh., and the Sciomyzid (Chamaemyiid), *Cremifania nigrocellulata* Czerny, and some thousands of adults of all these were despatched to Canada by air in 1951–53. *A. obliterata* occurred in all three areas, and observations made on it in the course of the work are described.

In the field, the first eggs of this Coccinellid were deposited on the trunks of infested trees in late April or early May, and the females are believed to lay up to 200 or more eggs each. Larvae were found from the beginning of May until the middle or end of June. Those in the early instars attacked eggs, migrating neosistentes and fixed sistentes of *Chermes piceae*, while those in the third and fourth destroyed all stages of the host. *C. nordmannianae* Eckstein (*D. nüsslini* Börn.) was also attacked, and in the absence of other food, the larvae fed on larvae of *L. erichsonii* or eggs of their own species. Pupation took place on the trees, the pupae occurring from late May to early July, but the adults left soon after emerging and returned only in the following April. In the laboratory, at 20–22°C. [68–71·6°F.], the egg, larval and pupal stages lasted 4, about 13 and 6 days, respectively [*cf.* **39** 405].

Pupae of *A. obliterata* were parasitised in all three areas by the Phorid, *Phalacrotophora berolinensis* Schmitz, the adults of which were observed in swarms on infested trees in late May or early June. The eggs were laid on the hind half of the pupa and hatched in about 30 hours at 20°C. The larvae fed in the pupae, up to seven in a single individual, and became full-fed in about three weeks, and the pupal stage lasted 19–20 days at 25°C. [77°F.], the adults emerging in July, though some did not do so until the following spring. About 3 per cent. of the *Aphidecta* larvae collected in Switzerland and the Vosges were parasitised by *Hexamermis* sp.

Mass rearing of adults of *A. obliterata* for despatch to Canada was carried out entirely in the field, branches infested by *C. piceae* being caged with gauze and field-collected eggs of the predator introduced. About 200–400 pupae were obtained from each cage and removed to the laboratory. The adults were despatched in special boxes with a mixture of agar, honey and sugar as food as soon as they emerged and arrived in Canada without noticeable loss.

Schreier (O.). *Cnephasia virgaureana* **Tr. (Lepidopt., Tortr.) an Beta-Rüben.** [*C. virgaureana* on Beet.]—*Pflanzenschutzberichte* **11** pt. 5–6 pp. 84–87, 2 figs., 2 refs. Vienna, 1953. (With a Summary in English.)

Sugar and fodder beet grown in several districts in Lower Austria was damaged in May 1953 by a Tortricid identified as *Cnephasia virgaureana* (Tr.) which is polyphagous but had not previously been recorded as feeding on beet. The larvae rolled the leaves, occasionally webbing them together, and also fed on the inflorescences of beet grown on for seed, reducing the yield, but in general infestation was not severe enough to cause significant damage. Larvae transferred to sugar beet in an experimental garden pupated on the plants at the end of May, and the adults emerged about 17–19 days later. Two unidentified Braconids were reared in small numbers from the pupae. A parathion spray applied in cool weather appeared to have little effect on the larvae, which are well protected in the rolled leaves.

Kawecki (Z.). **Tarcznik niszczyciel (tarcznik San José)**—(*Quadraspidiotus* (*Aspidiotus*) *perniciosus* **Comst.) w Europie i jego pojawienie sie w Polsce.** [The destructive San José Scale (*Q. perniciosus*) in Europe and its Appearance in Poland.]—*Prace roln.-leśne* no. 55, [2 +] 54 pp., 7 col. pls., 6 figs., 3 fldg. maps, 134 refs. Cracow, 1950. (With a Summary in English.)

Following preliminary observations in 1948, a survey in March 1949 showed that *Quadraspidiotus perniciosus* (Comst.), which had not previously been recorded as established in Poland, was present in three localities in the Province of Cracow, the plants infested comprising 11 apple trees and a gooseberry bush. Infestation was light in most cases. As mature and immature females and crawlers were present as well as nymphs, it was evident that the females had survived the winter, which was unusually mild, and reproduced then or in early spring. No males were found. There was no evidence of parasitism by insects, but some of the scales were attacked by a fungus. Observations in the laboratory indicated that at least two overlapping generations could be produced in a year, but it is considered that the scale is unlikely to become established since Poland lies to the north of the climatic zone favourable to it. Combined sprays of tar distillate and DNC were applied in autumn and gave practically complete control of all the foci.

In view of the occurrence of the pest, information is given from the literature on its economic importance, distribution, bionomics, morphology, food-plants and control.

Ziarkiewicz (T.). **Z badań nad biologią owadów występujących na niektórych roślinach leczniczych.** [Investigation on the Biology of the Insects occurring on some medicinal Plants.]—*Ann. Univ. M. Curie-Skłodowska* (E) **6** no. 6 pp. 201–229, 27 refs. Lublin, 1951. (With Summaries in Russian and English.)

Lists are given of some 30 species of insects, of which about half are Coleoptera, found attacking *Archangelica officinalis* (*Angelica archangelica*), *Inula helenium*, *Melissa officinalis*, *Mentha sylvestris* var. *crispa*, *Salvia officinalis* or *Valeriana officinalis* in Poland in 1948–49, with notes on their bionomics and the injury caused. *Melissa* was the most severely infested.

Gołębiowska (Z.). **Wyniki badań nad szkodnikami zbóż.** [Results of Investigations on Pests of Cereals.]—*Bull. ent. Pologne* **20** (1950) pp. 12–36, 5 figs., 20 refs. Wrocław, 1951. (With a Summary in French.)

Examination of the stems of wheat, rye, barley and oat crops grown in the district of Pulawy, Poland, in 1941–45 showed that the commonest insect pests present were *Oscinella frit* (L.), which attacked all the cereals, particularly those sown in spring, and was commonest on oats, and *Chaetocnema aridula* (Gylh.), which mainly infested spring wheat and barley. *Mayetiola destructor* (Say) and *Chlorops pumilionis* (Bjerk.) (*taeniopus* Mg.) occurred in small numbers only, *Mayetiola* chiefly infesting winter wheat and barley, and *Chlorops* winter and spring wheat. On the whole, spring crops suffered more than winter ones, and wheat more than the other cereals. To reduce the infestation of winter crops, they should be sown between 15th and 30th September, the earlier date being suitable if the weather is cold and rainy and the later one if it is dry and warm. Early sowing affords the best protection to spring crops, but sowing can safely be delayed until the end of April or the beginning of May in cold damp weather.

Haber (A.). **Próba wyjaśnienia wplywu kręgowców na populację osnui gwiaździstej** *Acantholyda nemoralis* **Thoms. Hym. (ze szczególnym uwzględnieniem roli ptaków).** [An Attempt to explain the Effect of Vertebrates on the Population of *A. pinivora* (Hym.) (with special Consideration of the Rôle of Birds).]—*Prace Inst. Badawczy Leśn.* no. 85, 159 pp., 1 map, 2 fldg. tables, 52 refs. Warsaw, 1952. (With Summaries in Russian and English.)

Acantholyda pinivora Ensl. (*nemoralis* (Thoms.)) is a major pest of pine in parts of southern Poland [*cf. R.A.E.*, A **35** 27] and observations on its vertebrate predators, particularly birds, were carried out in the course of an outbreak in 1948–50. Notes on the bionomics of the sawfly are given. The forest consisted almost entirely of *Pinus sylvestris*, and the observations were conducted in April–July 1948 and April–September 1949. In all, 117 species of birds were recorded, and observations on their behaviour and analyses of their stomach contents showed that 26 species, a list of which is given, were of value in destroying the larvae and adults; only two of these had previously been recorded as such. The biology and ecology of the birds and their individual importance in control are discussed. Their value increased with the age and degree of depletion of the stands, the protection afforded reaching 100 per cent. in stands some 85 or more years old. Valuable control was also afforded by various rodents and other animals, particularly wild boars, which were found to consume large numbers of larvae in the soil [*cf.* **35** 28].

Ceballos (G.) & Zarco (E.). **Ensayo de lucha biológica contra una plaga de** *Diprion pini* **(L.) en masas de** *Pinus silvestris*, **de la Sierra de Albarracín.** [An Experiment on the Biological Control of an Outbreak of *D. pini* in Stands of *P. sylvestris* in the Sierra de Albarracín.]—38 [+ 1] pp., 10 pls. (7 col., 1 fldg.), 2 figs., 7 tables. Madrid, Inst. esp. Ent., 1952.

In September 1948, a severe outbreak of *Diprion pini* (L.) was observed in stands of *Pinus sylvestris* in the Sierra de Albarracín, in eastern Spain. Defoliation was severe, and the areas affected measured up to $4\frac{1}{2}$ by $1\frac{1}{2}$–2

miles. The bionomics of the sawfly are described; it had two generations a year in the district concerned, though there was also evidence of a strain with only one generation. A list is given of 12 parasites reared from the larvae or pupae, three of which were probably hyperparasites. The most important were *Dahlbominus fuscipennis* (Zett.) and *Exenterus oriolus* Htg., which attack the larvae in their cocoons, and *Sturmia inconspicua* (Mg.). Although the high degree of parasitism in the field indicated that the outbreak was probably declining, an attempt was made to assist natural control. Two tons of cocoons were collected in October and November 1948 and stored over the winter, to protect them from the risk of destruction, and exposed in February in parasite emergence boxes placed round the perimeter of the infested area, in order to increase the numbers of parasites where they were most needed. It is estimated that three million emerged in the boxes and were released. Laboratory rearing of *E. oriolus* and *S. inconspicua* was impracticable, but when sawfly cocoons collected in autumn were kept at 18°C. [64·4°F.], adults of *D. fuscipennis* emerged in a few days. These oviposited in unparasitised cocoons of the sawfly, and in this way 15,000 cocoons, at least 90 per cent. of which were parasitised, with an average of 50–55 parasites per cocoon, were obtained. These were added to the emergence boxes in spring. Samples of the cocoons taken from the field in 1949 and kept in the laboratory showed about 64 per cent. parasitism. There was a marked decrease in the numbers of the pest in the affected area, and the trees were recovering by autumn. No appreciable damage occurred in 1950, though injury was still severe in a neighbouring district in which no parasites had been released.

Giraldi (G.). **Osservazioni preliminari sulla** *Dasyneura (Perrisia) oleae* **Löw nel Veronese.** [Preliminary Observations on *D. oleae* near Verona.]—*Ann. Sper. agr.* (N.S.) **7** no. 3 pp. 827–836, 5 figs., 9 refs. Rome, 1953. (With a Summary in English.)

Olive near Verona is attacked by *Dasyneura oleae* (Lw.), though the damage caused is not usually serious. The larva, pupa and adults of this Cecidomyiid are briefly described, and an account is given of observations on its bionomics. The adults emerged in May and paired, and eggs were laid on the lower surfaces of the young leaves or other plant parts. The larvae hatched in a few days and entered the leaves, leaf stalks and flower stalks, causing the formation of galls in which they fed and overwintered. Feeding was resumed in spring, and pupation occurred in the second half of April. The galls, which are described, were commonest on the leaves that developed in April, as many as 15–20 being found on one leaf, and infestation resulted in some loss of leaves and flowers. Two unidentified parasites of the larvae were observed, one of which appeared to be fairly common. Heavily infested branches should be removed, clean cultivation practised, and cultural measures adopted to increase the vigour of the trees.

Viel (G.) & Chancogne (M.). **Étude des actions ovicides. I. Techniques d'essai.**—*Ann. Épiphyt.* **1** (1950) no. 3 pp. 293–306, 3 figs., 14 refs. Paris [1951]. **II. Toxicité des dinitrophénolates.**—*Op. cit.* **2** no. 3–4 pp. 450–455, 2 graphs, 5 refs. 1951.

Chancogne (M.). **III. Influence des mouillants sur la toxicité du dinitrocrésylate de sodium.**—*Op. cit.* **3** no. 3 pp. 323–328, 1 graph, 3 refs. 1952.

In the first part of this series, the authors describe laboratory techniques developed in France to study the effectiveness of ovicides for winter use on

fruit trees. Tests were carried out with eggs of *Ephestia kuehniella* Zell. from a laboratory culture, *Operophtera brumata* (L.) laid by females trapped on the trees and *Aphis pomi* Deg. laid on apple twigs, and both immersion and spraying were used. The moth eggs were treated on filter paper, immersion being by pouring the liquid on to them and drawing it off by means of a filter pump after 30 seconds. The ovicide selected as standard was DNC (sodium) and preliminary tests with this are described. Treated eggs were kept at 25°C. [77°F.] and 40–60 per cent. relative humidity, mortality was calculated by Abbott's formula [*R.A.E.*, A **13** 331], and dosage-mortality curves were plotted. The solutions used were of pH 6, and 0·125, 0·25 and 0·5 per cent. of the salt gave averages of 10, 30 and 63 per cent. mortality of *Ephestia* eggs in the sprays and 24, 32 and 89 per cent. by immersion, the corresponding percentages for *Operophtera* being 35, 72 and 86, and 26, 83 and 100, respectively. Mortality of the Aphid eggs was high and irregular, and it is concluded that even the lowest concentration tested (0·06 per cent.) was sufficient to kill all the eggs that were properly covered with the liquid. It is concluded that eggs of the Aphid are unsuitable for tests of ovicides, that those of *Ephestia* give a good indication of toxicity to *Operophtera*, and that eggs of the latter are the most suitable for accurate assessments.

In the second part, tests are described showing that the solubility of the laboratory-prepared sodium, calcium and barium salts of DNC decreased in that order and that all gave solutions of pH 6–7. The median lethal concentrations by immersion were 0·14, 0·07 and about 0·08 per cent., respectively, for eggs of *O. brumata*, and about 0·2 and 0·07 per cent. for the first two against *E. kuehniella*, the third being too little soluble for determination against that insect. In tests with various commercial and technical products against eggs of *Ephestia*, it was confirmed that toxicity varied directly with acidity [*cf.* **36** 273–274, etc.]. The median lethal concentrations for alkaline solutions were much the same as those of more acid ones, but higher concentrations of the former caused no proportionate increase in kill, so that mortality was not complete for several materials giving alkaline solutions even at the limit of solubility.

In the tests described in the third part, eggs of *E. kuehniella* were treated by the immersion technique with 11 wetting agents at concentrations at which they would be used in sprays. Only one had any ovicidal effect, and that was slight. One neutralised alkaline solutions of DNC (sodium) and thus increased their effectiveness, but none affected the acidity of solutions of pH 6·6 or increased their toxicity in immersion tests, in which the increased coverage that wetting agents give to sprays is not a factor. It is concluded that the wetting agents showed no synergistic action.

Roehrich (R.). **Parasites et prédateurs du criquet migrateur** (*Locusta migratoria gallica* **Rem.**) **dans les Landes de Gascogne de 1945 à 1950.**—*Ann. Epiphyt.* **2** no. 3–4 pp. 479–495, 7 figs., 18 refs. Paris, 1951. **Étude sur le régime alimentaire du criquet migrateur dans les Landes de Gascogne** (*Locusta migratoria gallica* **Rem.**).—*T.c.* pp. 496–508, 8 figs., 17 refs. Paris, 1951.

An outbreak of *Locusta migratoria gallica* Remaudière occurred in the Landes region of France in 1945–48 [*cf. R.A.E.*, A **39** 224, etc.], and an account is given in the first of these papers of observations on the natural enemies of the locust, carried out mainly in 1947–48, but including some earlier and later records by others workers.

Natural enemies of the eggs were of little importance. The only parasite

observed was a Scelionid of which several examples were found in an egg-pod in 1946, and the principal predators were the Bombyliid, *Anastoechus nitidulus* (F.), and the Calliphorid, *Stomorhina* (*Stomatorrhina*) *lunata* (F.). The larvae of *A. nitidulus* developed in the egg-pods until about mid-September or October, when they formed earthen cells in the soil in which they remained in diapause until the following July or August, and adults were present in July–September. *S. lunata* was common in 1946, but the adults emerged prematurely at the end of October in the laboratory and probably also in the field, with resultant high mortality [*cf.* **19** 565], and the species was found only once in 1947. Nematodes attacked eggs that were submerged during winter.

Parasites of the adults gave considerable control. The most important were the Sarcophagid, *Blaesoxipha* (*Gesneriodes*) *lineata* (Fall.), and the Anthomyiid, *Acridomyia sacharovi* Shtak. Females of *B. lineata* pursue flying locusts and emit 1–4 larvae, which fall on to their hosts and enter the body cavity. When full-fed, they leave the locusts, enter the soil and pupate, overwintering as larvae or pupae. Pupae were first observed on 4th September in 1947 and were present in varying proportions in different localities. The wound caused by the emergence of the larvae soon healed, and the host suffered no serious injury, although oviposition was reduced by multiple attack. The percentage parasitism varied with locality, season and sex and averaged 25, 42 and 42 in September–October in 1945, 1946 and 1947, respectively, and 43 in August 1948, after which the locusts were too rare for calculations to be valid. Larvae were observed in two fifth-instar hoppers in 1948, presumably as a result of accidental attack.

Most of the information on *A. sacharovi* is based on a paper already noticed [**35** 423]. Parasitism was generally very low in July and mid-August but increased towards the end of each summer and also from year to year until, in 1950, all the few remaining adults were parasitised. This increase, despite a decrease in the host population, is attributed to a long diapause undergone by almost all the pupae that are formed in September–October; some formed in September 1945 were still in diapause in April 1947. Hoppers were more frequently parasitised by *A. sacharovi* than by *B. lineata*, but the numbers attacked were small. A bacterial disease with symptoms resembling those caused by *Coccobacillus acridiorum* gave high mortality of locusts under the moist conditions of 1948.

In the second paper, the injury caused to plants by *L. m. gallica* is described. The locusts normally consumed graminaceous plants, but the succulent parts of others were sometimes attacked, particularly in dry localities and on warm days, thirst rather than hunger probably being the cause. In rearing tests with grasses common in the outbreak areas, development was most rapid and mortality least on *Poa pratensis* and *P. annua*. *Molinia caerulea* was the commonest food-plant in the outbreak areas, and development was completed on it.

CHAUVIN (R.). **Nouvelles recherches sur les substances qui attirent le doryphore** (*L. decemlineata* **Say**) **vers la pomme de terre.**—*Ann. Épiphyt.* **3** no. 3 pp. 303–308, 4 refs. Paris, 1952.

The investigations of Raucourt & Trouvelot on the substances in potato leaves that attract larvae of *Leptinotarsa decemlineata* (Say) were continued [*cf. R.A.E.*, A **24** 513], discs of elder pith impregnated with extracts from the leaves being used in a modification of their technique. Two methods for preparing leaf extracts are described, and the relative attractiveness of several varieties of potato, as shown in the tests, is recorded. It was confirmed that solanin is not an attractant [*cf.* **24** 514]. An alcohol

extract of the crushed larvae contained a highly attractive substance that was not further investigated.

Vasseur (R.), Schvester (D.) & Bianchi (H.). **Sur l'effet aphicide de certains traitements contre le pou de San José (*Quadraspidiotus perniciosus* Comst.).**—*Ann. Épiphyt.* **3** no. 3 pp. 339–350, 4 figs., 8 refs. Paris, 1952.

The principal materials used in sprays against *Quadraspidiotus perniciosus* (Comst.) on fruit trees in France are mineral oils with or without the addition of DNC for winter treatment and with DDT for application in spring or summer. All three give good control, but as they constitute an extra burden on growers, the possibility of using them for simultaneous control of Aphids was investigated near Lyons in 1949–51.

In tests against several unidentified species of *Anuraphis* (*Dentatus*) that overwinter in the egg stage on pear and roll the leaves in summer, sprays of 1, 2 or 3 per cent. of a product containing 2·5 per cent. DNC and 75 per cent. oil were applied on 24th February 1949 in favourable weather. The infested shoots were counted on 14th May, when infestation on the controls was general and injury evident. The three treatments gave 94·5, 99·5 and 100 per cent. control, respectively, as compared with no treatment, and also reduced infestation by *Eriophyes pyri* (Pgst.). The 3 per cent. spray is recommended for use in heavily infested areas.

Against the winter eggs of *Aphis pomi* Deg. on apple, 3 per cent. white oil applied on 1st February or 7th March was unsatisfactory, but 2 per cent. of the product containing DNC and oil gave 97·5–98·5 per cent. mortality, as compared with 18·4 per cent. for no treatment, and was practically as effective as 0·025 per cent. DNC alone. In all cases, the later treatment was the better.

Adults of *Anuraphis persicae-niger* (Smith) overwinter on the roots of peach and migrate to the branches in spring. Migration occurred in early March in 1950, and a spray of 0·01 per cent. DDT with 1 per cent. summer oil applied on 10th March gave excellent control and was at least as effective as 0·01 per cent. parathion. Owing to the early date of treatment, predators, particularly Coccinellids, were not harmed and later played an important part in preventing infestation from rising above a low level.

Very good control of the winter eggs of *Hyalopterus arundinis* (F.) and *Myzus persicae* (Sulz.) on peach was given by 2 per cent. of the product containing DNC in oil applied on 5th March. Three colonies of *H. arundinis* were found after a fortnight on one of the 12 treated trees, but none of *M. persicae*, whereas of eight untreated trees, three were infested by *H. arundinis* and seven by *M. persicae*. Infestation by Tetranychid mites was also reduced.

Jover (H.) & Brenière (J.). **Recherches sur le mode d'action du H.C.H. (isomère gamma) en tant qu'insecticide de contact sur le grillon domestique: *Gryllulus domesticus* L.**—*Rev. Path. vég.* **29** fasc. 4 pp. 195–212, 10 figs., 9 refs. Paris, 1950.

Experiments in which γ BHC, pure or diluted with talc, was applied to various parts of the body of adults of *Acheta* (*Gryllulus*) *domestica* (L.) showed that the insecticide penetrated the integument by a combination of mechanical and chemical means and was transferred by the blood to all tissues, muscles and nerve centres; this resulted in functional damage due to general poisoning and ultimately led to death. It also acted directly on

the nerve tissues through the sensory nerve endings, particularly those on the tarsi, antennae and cerci, in which case the poison was transferred by the nervous system and caused muscular spasms and progressive paralysis, also leading to death. The action on the nervous and muscular tissues resulted in spasms of the respiratory muscles and consequent acceleration of respiration, followed by paralysis. The loss of water observed was due partly to this increased respiration and partly to evaporation as a result of abrasive and chemical damage to the integument. Similar effects on respiration and the nervous system were observed when the crickets were exposed to the vapour from γ BHC. It is concluded that the respiratory system may be affected simultaneously by the two methods of poisoning, the symptoms of which are generalised and alike.

Constantin (J.). **Rôle du temps de contact de la surface et de la zone traitée dans les effets toxiques de l'isomère gamma du H.C.H. sur** *Gryllulus domesticus* **L.**—*Rev. Path. vég.* **29** fasc. 4 pp. 213–225, 8 figs., 3 refs. Paris, 1950.

In the experiments described, γ BHC alone or diluted with talc, was applied to various parts of the body of adults of *Acheta* (*Gryllulus*) *domestica* (L.) and removed after fixed intervals. The results showed that the rapidity of penetration did not depend on the thickness of the cuticle or proximity to the blood stream but on the presence of nerves and the physiological properties of the cuticle, which modified its permeability to poisons even though it was histologically apparently homogeneous. The nervous system appeared to be the first vital point of attack, whatever the part treated, and the means by which the poison is distributed in the body [*cf.* preceding abstract].

Gairaud (R.) & Besson (J.). **Tests toxicologiques effectués sur jeunes larves de** *Capnodis tenebrionis* **L. à El-Affroun (Algérie) en 1949.**—*Rev. Path. vég.* **29** fasc. 4 pp. 236–243, 12 refs. Paris, 1950.

Experiments were carried out in Algeria in 1949 on the possibility of controlling the newly hatched larvae of *Capnodis tenebrionis* (L.) with insecticides before they enter the roots of fruit trees [*cf. R.A.E.*, A **40** 70]. Boxes containing 700 gm. soil with a surface area of 150 sq. cm. were used, and the soil was treated with DDT and BHC at 20, 30, 40 or 50 gm. per sq. metre in wettable-powder suspensions or dusts, with parathion at 2, 3, 4 or 5 gm. per sq. metre in a wettable-powder suspension or an emulsion prepared from a concentrate, or with p-dichlorobenzene at 30 or 60 gm. per sq. metre; p-dichlorobenzene and the dusts were thoroughly mixed with the soil. Newly hatched larvae of *C. tenebrionis* were released on the surface at various intervals after treatment, and pieces of almond branch that had been cut in several places to facilitate entry were placed as attractants in each box a short time after each release and examined after about a day to ascertain the survival of the larvae. The results, which are given in tables, showed that DDT and p-dichlorobenzene were ineffective and that parathion lost its initial effectiveness within a week. BHC gave good results at all but the lowest dosage, with no difference between suspension and dust, and remained effective for a month or more.

In a practical test in September, watering the soil round young plum trees in a nursery with a suspension of 0·4 or 0·5 per cent. BHC at the rate of 10 litres per sq. metre afforded complete protection against infestation by larvae released 12 days later, whereas an untreated tree became infested.

Schouteden (H.). *Habrochila Ghesquièrei* **nov. spec. parasite du caféier (Hem. Tingididae).**—*Rev. Zool. Bot. afr.* **48** fasc. 1–2 pp. 104–105. Brussels, 1953.

Tingids of the genus *Habrochila* that attack coffee in the Belgian Congo have hitherto been referred to *H. placida* Horv., which was described from coffee in that country and considered to be a serious pest, but examination of the material in the Museum at Tervuren established that two species had been confused under this name and that some of the specimens belonged to a new species here described as *H. ghesquièrei*. This Tingid is very common on coffee in several districts of the Belgian Congo, and both it and *H. placida* are also recorded from Uganda [*cf. R.A.E.*, A **25** 351, etc.].

Narayanan (E. S.) & Rattan Lal. **A short Review of recorded Information on the Control of Termites damaging Crops in India; along with Results of recent Control Experiments at Delhi.**—*Indian J. Ent.* **14** pt. 1 pp. 21–30, 22 refs. New Delhi, 1952.

The authors briefly review the literature on the control of termites attacking field crops in India and give an account of tests with organic insecticides made at Delhi in 1945–47. These were carried out in plots of wheat and sugar-cane in which the principal termites were *Microtermes obesi* Hlmgr. and *Odontotermes* (*Termes*) *obesus* (Ramb.), respectively, though the latter sometimes also damaged wheat and the sugar-cane setts were sometimes attacked by *Eremotermes paradoxalis* Hlmgr. The organic materials used were p,p′DDT and disodium ethylene bisdithiocarbamate (Dithane), both in emulsion concentrates, and a dust of 0·5 per cent. γ BHC, and in the sugar-cane plots they were compared with previously recommended sprays of 10 per cent. lime with 1 per cent. lead arsenate and 4 per cent. lime with 2 per cent. paris green. A DDT dust was included in 1945–46 only. For the soil treatments, sprays were applied along the furrows at a rate of 320 gals. per acre, and the BHC dust at 20 lb. per acre. No significant results were obtained in 1945–46, and infestation in the control plots was light in 1946–47, so that the results are not regarded as conclusive. In the experiments on wheat in the latter years, sprays of DDT applied to the seed at a concentration of 5 per cent. or to the soil before or after sowing at 1·25 per cent. and the BHC dust applied to the seed or to the soil before sowing gave highly significant reductions in the percentage of plants damaged, and the DDT was significantly more effective when applied to the soil than to the seed. A spray of 1·5 per cent. Dithane applied to the soil before sowing and the BHC dust applied after sowing did not give significant reductions. In the tests with sugar-cane, highly significant reductions were obtained by treating the setts with the paris-green mixture or the soil before planting with the 1·25 per cent. DDT spray, and significant ones by treating the setts with 5 per cent. DDT or the lead-arsenate mixture or the soil before planting with the BHC dust. Termite attack occurred most commonly at the cut ends of the setts; it did not prevent sprouting unless the undeveloped buds were directly attacked, but the young plants ultimately withered. Termite feeding on the roots of wheat caused weakened growth and yellowing of the foliage, and when all the roots had been destroyed, the plants withered and died. Healthy plants that were able to replace the damaged roots were not much affected.

Tirumala Rao (V.). **The Paddy Root Weevil** (*Echinocnemus oryzae* **Mshll.)—a Pest of Paddy in the Deltaic Tracts of the northern Circars.** —*Indian J. Ent.* **14** pt. 1 pp. 31–37, 5 figs., 2 refs. New Delhi, 1952.

Echinocnemus oryzae Mshl. [*R.A.E.*, A **13** 420] has since 1936 become of increasing importance as a pest of rice in north-eastern Madras. The larvae of this weevil, which are described, feed on the rootlets of transplanted rice, and of grasses and sedges, from the beginning of July until the middle or end of September, becoming less numerous after mid-August. When they become full-fed, they burrow deep into the soil and construct cocoons, from which the adults emerge in the following May or June, after the early showers associated with the monsoon. There is no infestation where a second crop is grown during February–May, since puddling the fields in February destroys the resting larvae, or in sandy soils. As a result of attack, the plants become stunted in growth, fail to produce tillers and may even die, necessitating at least one replanting. Late-planted rice is attacked only from the end of July until mid-August, and damage is usually slight. Infestation is most severe when early rains, which facilitate emergence, are followed by continuous wet weather favouring early transplanting. No varietal differences in susceptibility to attack have been observed.

In experiments on control, sprays containing ½ oz. 50 per cent. wettable DDT or BHC per gal. were effective against the adults and would give valuable control if applied to weeds and grasses in and near the rice-fields when the adults first appear. Kerosene and light applications of crude-oil emulsion were of no value against the larvae, but tobacco refuse, neem cake (prepared from *Melia azadirachta*) and a 8 : 5 mixture of superphosphate and ammonium sulphate checked the larvae when applied to the soil and were also of manurial value. The first two materials are not easily procurable, but the mixture is stated to be in extensive use. The superphosphate in it drives the larvae from the active feeding zone of the roots to the fibrous roots where their feeding has little effect. Infestation can be reduced by delayed planting, and the author states in a foot-note that in 1951, when infestation was favoured by an early monsoon, this measure gave local protection.

Batra (H. N.). **A Record of the Fig Midge at Delhi.**—*Indian J. Ent.* **14** pt. 1 p. 60. New Delhi, 1952. **Occurrence of three Banana Pests at Delhi.**—*T.c.* p. 60.

In the first of these notes, the Cecidomyiid, *Anjecrodiplosis peshawarensis* Mani, which attacks figs in the North-West Frontier Province, Pakistan, is recorded for the first time at New Delhi, where it was observed on a fig tree during April–July 1951. By mid-July, almost all the figs on the tree were abnormally elongated, and each of these was found to contain some hundreds of larvae, which leave by a single, circular exit hole when fully grown. It is further stated that the Coccid, *Lapazia peshawarensis* Rahman & Ansari, has been noted at Delhi on peaches and pears imported from the North-West Frontier Province [*cf. R.A.E.*, A **32** 238]; it is not known whether this represents a danger to plants in the neighbourhood.

In the second note, the author records the first occurrences of three pests of banana at Delhi and gives brief indications of the damage caused by them. They are the Eumolpid, *Nodostoma subcostatum* Jac., and the weevils, *Cosmopolites sordidus* (Germ.) and *Odoiporus longicollis* (Ol.), of which the first two are widely distributed in India; all were restricted to a few gardens.

Cumber (R. A.). **Some Aspects of the Biology and Ecology of Humble-bees bearing upon the Yields of Red-clover Seed in New Zealand.**—*N.Z. J. Sci. Tech.* **34** (B) no. 4 pp. 227–240, 1 fig., 9 refs. Wellington, N.Z., 1953.

Species of *Bombus* are the chief pollinators of red clover, but only three occur in New Zealand, where yields of red-clover seed are in consequence poor, and some of the species present in England were accordingly studied in 1946–48 with a view to the introduction of promising ones. Six were considered suitable, but no introductions were made, owing to the risk of introducing the Isle of Wight disease of honey bees. Information on the ecology and collection of *Bombus* spp. is given in order to facilitate any future attempts to introduce them from countries where the disease does not occur.

Cumber (R. A.). **Studies on *Oliarus atkinsoni* Myers (Hem. Cixiidae), Vector of the " Yellow-leaf " Disease of *Phormium tenax* Forst. I.—Habits and Environment, with a Note on natural Enemies.**—*N.Z. J. Sci. Tech.* **34** (B) no. 2 pp. 92–98, 2 figs., 2 refs. Wellington, N.Z., 1952. **II.—The nymphal Instars and seasonal Changes in the Composition of nymphal Populations.**—*T.c.* no. 3 pp. 160–165, 8 figs., 2 refs. **III.—Resistance of nymphal Forms to Submergence-control by Inundation.**—*T.c.* no. 4 pp. 260–266, 1 fig., 3 refs. 1953.

In the first of these three papers dealing with research on *Oliarus atkinsoni* Myers, which transmits the yellow-leaf disease of *Phormium tenax* in New Zealand [*cf. R.A.E.*, A **40** 95], the author describes investigations on the bionomics of this Cixiid carried out at a research station in the North Island. Total development lasted about two years. The adults were present on the upper parts of the plants from November to March, and as many as 30 were found on a single leaf blade. Mating took place on the leaves. Adults that emerged in the laboratory survived on *Phormium* in pots for four weeks, each female laying a single batch of eggs after a preoviposition period of two weeks. The eggs were deposited between the leaf bases in groups of 50–90 in a pad composed of a mealy filamentous substance that is secreted freely by the females and nymphs. The nymphs hatched after some 12 weeks and, if the egg mass had become damp owing to falling vegetation or increased plant cover, they remained near it for several months, during which their source of food was unknown. Most of the nymphs, except those about to become adult, occurred near living roots and rootlets passing through the dead basal sheaths surrounding the rhizome. They fed on the roots, and the filamentous material produced by them was rubbed off and formed galleries, which afford some protection from water and predators.

Healthy *Phormium* plants usually produce only thick, unbranched primary roots in the immediate vicinity of the rhizomes, and these were preferred by the older nymphs, but rootlets from neighbouring plants or shoots often enter this region and provide food for the smaller nymphs. In plants infected with yellow-leaf, however, the primary roots branch much nearer their source, and in consequence large numbers of fine roots ramify through the dead basal material. Many of the new primary roots cease growth on entering the galleries and die back, leaving a yellow gummy substance that becomes invaded by fungi and nematodes. Primary roots that pass through the galleries of the fifth-instar nymphs showed numerous feeding punctures radiating outwards from the centre through the cortex, from which they seemed to be sealed off, thus facilitating the entry of fungi.

As a result, decomposition spread longitudinally through the cortical zone, though it did not appear to extend into the rhizome.

Towards the end of October, the fifth-instar nymphs migrated upwards to the drier portions of the plant bases, especially the shoots that had died following the previous harvest, or even sought shelter away from the plants, and underwent the final moult. Both nymphs and adults were destroyed by spiders, and the nymphs also by other predators. The nymphs were attacked by a fungous or bacterial disease, and the adults and those of *O. oppositus* (Wlk.), which also occurs on *Phormium*, by a fungus.

The second paper contains descriptions of the five nymphal instars of *O. atkinsoni*, with notes on seasonal development, based on observations during 1951–52. Nymphs that hatched from eggs laid in March had mostly reached the second instar by October and the fifth by the following April; most overwintered in this stage, though some passed the winter in the fourth instar. Adults were numerous in collections made between 16th November and 7th January, and egg masses were common between 7th January and 1st April.

An account is given in the third paper of laboratory experiments indicating that about 90 per cent. of the nymphs would be killed by flooding for 14 days [*cf.* **40** 95], but although this gave complete control in field trials, the plants became reinfested from surrounding areas and oviposition was resumed within two weeks. Nevertheless, flooding is considered of value in low-lying areas, and would in addition destroy other injurious insects and weeds and increase soil fertility. The cultivation of *Phormium* on higher land that cannot be flooded should be discontinued unless other methods of control can be devised.

CUMBER (R. A.). **The Establishment in New Zealand of** *Microphanurus basalis* **Woll. (Scelionidae: Hym.), Egg-parasite of the Green Vegetable Bug,** *Nezara viridula* **L. (Pentatomidae).**—*N.Z. J. Sci. Tech.* **34** (B) no. 4 pp. 267–269, 2 refs. Wellington, N.Z., 1953.

Observations during February 1950 in the three areas in the North Island of New Zealand in which the introduced Scelionid, *Microphanurus basalis* (Woll.), appeared to have become established as a parasite of the eggs of *Nezara viridula* (L.) in the previous year [*cf. R.A.E.*, A **40** 30] showed that *N. viridula* was less numerous in all of them, though direct evidence of parasitism was found only at Paihia, Bay of Islands, where 80 per cent. of the egg-masses were attacked. *M. basalis* was again recovered from this place in February in 1951 and 1952, and in the latter year the percentage of parasitised egg-masses had risen to 90. Before the introduction of the parasite, infestation by *N. viridula* had hindered the cultivation even of early vegetables, but by 1952, overwintered populations were reduced to such an extent that crops remained relatively uninfested until late in February. During March, adults migrated to gardens from uncultivated land, but very few nymphs developed on the vegetable crops. Parasites were recovered almost a mile from the original liberation site, but the natural rate of spread is difficult to estimate because of the possibility of accidental transport, chiefly in the host eggs on vegetables, which is likely to become of increasing importance. Parasites collected at Paihia were released near Auckland in February 1951 and at Dargaville (North Island) and Nelson (South Island) in February 1952. By March 1952, *N. viridula* was stated to be much reduced near Auckland, three of five egg-masses found were completely parasitised, and an adult parasite was seen attacking a fourth. A consignment of some 3,000 parasites and parasitised eggs

shipped to the island of Mangaia (Cook Islands) was subjected to considerable delay and few survived the journey.

Kilpatrick (D. T.). **Profit from Potatoes increased by DDT.**—*J. Dep. Agric. S. Aust.* **56** no. 11 pp. 504–506, 4 figs., 1 ref. Adelaide, 1953.

Leaf-roll is the most important of the factors that cause reduced yields of potato tubers in the Adelaide Hills district of South Australia and was responsible for reductions of 33–50 per cent. in 1951–52. The varieties mostly grown are very susceptible to the virus, and infection frequently reaches 100 per cent. in second- and third-year crops from certified stocks. The tubers are sprouted prior to planting and, during this process, healthy and infected ones are commonly kept in close proximity. The sprouts become heavily infested by the vector, *Myzus persicae* (Sulz.), and remain so for up to three months. To determine the effect of infection transmitted at this stage, two layers of tubers, separated by wire netting, were sprouted on the same tray; the upper layer consisted of tubers from infected plants and the lower of tubers from a certified stock. Aphids were introduced on several occasions, but establishment was hindered by parasitism. The certified tubers subsequently produced plants of which 41 per cent. showed symptoms of leaf-roll. The rest of the stock from which they were taken was planted in the same field, and only three infected plants were found in a half-acre plot examined. Aphids on sprouting tubers can be controlled by sprays of 0·1 per cent. or dusts of 2 per cent. p,p′DDT, and there is some evidence that a single application of dust is sufficient under shed conditions.

Pradhan (S.), Nair (M. R. G. K.) & Krishnaswami (S.). **Lipoid Solubility as a Factor in the Toxicity of Contact Insecticides.**—*Nature* **170** no. 4328 pp. 619–620, 2 figs., 1 ref. London, 1952.

Since contact insecticides as a class are lipoid-soluble, experiments were carried out on the solubility of DDT in the epicuticular wax of insects. The wax was extracted from larval exuviae of *Euproctis lunata* Wlk., which is susceptible to DDT, and *Trogoderma granarium* Everts, which is more resistant. The extracts were dissolved in chloroform to give 0·05 per cent. solutions, 1 cc. of each was spread on a glass cover slip 2·25 cm. square, and the chloroform was allowed to evaporate, leaving a fairly uniform wax film about 10 μ thick. The films were sprayed in a tower with an acetone-water suspension of DDT crystals (8 × 32 μ in size) and examined under a microscope at intervals. The crystals began to sink into the wax as soon as they settled on it and were completely covered by *Euproctis* wax in about one minute and by *Trogoderma* wax in 15–30 minutes. They began to show signs of dissolution within five minutes in *Euproctis* wax and had almost completely disappeared in 30–45 minutes, whereas very few showed any sign of dissolution in *Trogoderma* wax during the same period. A few crystals that remained undissolved in *Euproctis* wax were found to be protected by a film of water, but no such reason could be adduced for their persistence in *Trogoderma* wax. When the treated *Euproctis* wax was kept at 32°C. [89·6°F.], all the crystals had dissolved within one hour, but when it was kept at 10–15°C. [50–59°F.], only a very small number dissolved in 24 hours; the crystals showed only slight change on *Trogoderma* wax at either temperature.

When sprayed larvae of *T. granarium* were observed under a microscope, the DDT crystals could be detected, with their outlines more or less intact, on the insect body even after a week, indicating that they were not being

absorbed quickly. The percentage mortalities of larvae of the two species after spraying with 0·0156–0·125 per cent. suspensions of DDT crystals of different sizes ranged from 24 to 80 in four days for *E. lunata* and from 0 to 30 in 50 days for *T. granarium*.

Gyrisco (G. G.) & Evans (W. G.). **Granular Insecticides.**—*Agric. Chem.* **9** no. 1 pp. 32–33, 3 refs. Baltimore, Md., 1954.

Granular formulations of insecticides [*cf. R.A.E.*, A **41** 370] were tested for the control of larvae of the European chafer [*Amphimallon majalis* (Razoum.)] in pasture sod in New York in 1953, the materials used being dieldrin, heptachlor, chlordane and toxaphene impregnated on 30–60 mesh Attaclay and a proprietary product consisting of 2 per cent. aldrin on tobacco waste, the bulk of which would be retained by a 60-mesh screen. They were applied with a small hand-operated fertiliser spreader. The tobacco waste was much easier to apply uniformly at the low rates required than the less bulky Attaclay, but both required further dilution to give even coverage, and since the addition of inert granules would have changed the formulation of the insecticides, an inert dust of different specific gravity (pyrophyllite) was added, so that each constituent would act independently. Applications at the rate of 1–2 lb. aldrin, dieldrin or heptachlor or 10 lb. chlordane in 400 lb. total granules and dust per acre were made on 6th August and were followed by 2·36 ins. rain on 8th–10th August, which aided penetration into the soil. All gave rapid and excellent control, the differences between them, though significant in some cases, not being of practical importance. Dieldrin appeared the most effective of all. Toxaphene, applied in the same way at 10–20 lb. per acre, did not give satisfactory control. The results showed that granular formulations were equal to dusts and sprays [*cf.* **41** 274, etc.] in toxicity and speed of action, but further investigations on persistence and effectiveness under adverse conditions are necessary before their long-term value can be known.

Papers noticed by Title only.

Karpiński (J. J.). **Zagadnienie walki z chrabaszczem za pomocą grzyba *Beauveria densa* Pic.** [The Problem of the Control of *Melolontha* Means of the Fungus, *Beauveria densa*.]—*Ann. Univ. M. Curie Skłodowska* (E) **5** no. 2 pp. 29–75, 16 refs. Lublin, 1950. (With Summary in English.) [For less detailed account see *R.A.E.*, A 608.]

Gołębiowska (Z.). **Wolek zbożowy (*Calandra granaria* L.). Morfologia, biologia, ekologia i zwalczanie.** [The Granary Weevil (*C. granaria*). Morphology, Biology, Ecology and Control (a review of the literature).]—*Roczn. Nauk rol.* **64** pp. 137–221, 9 figs., 2 graphs, 76 refs. Cracow, 1952. (With Summaries in Russian and English.)

Daviaud (R.). **Étude des méthodes de dosage du D.D.T.** [a comparison of methods of determining DDT, including experimental results].—*Ann. Épiphyt.* **3** no. 4 pp. 511–525, 2 figs., 31 refs. Paris, 1952.

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